GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

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EDITORIAL NOTES.

Coal Supplies.

RECKONING there are a million men out of work in the coalfields, this means that up to to-day no less than 124 million man-shifts have been lost. This stupendous figure tells of a wicked waste, which a mere handful of men have been instrumental in producing. It is true that, at the end of last week, it was estimated that there were 150,000 men at work, including safety men, and men operating on outcrop coal. It was also reported by a colliery owner that the men working at the face are, owing to the extra working time and their individual energy, producing from 6 to 10 cwt. more per shift than they were doing before the stoppage, which means for them more wages. In consequence, among them there is evidence of perfect satisfaction and happiness at being back at their old occupation. But their production, while very useful, is but a small contribution to the total needs of the country.

In view of this, an instruction should be issued by the Mines Department that the coal which is produced should be applied, in the interests of the whole community, to those purposes for which it is most useful. A large proportion of this British coal is, for example, more valuable than much of the foreign coal for the purposes of gas making, quite apart from the high price of the imported material, which is a grievous burden on the industry. It should be remembered by the Mines Department that much of the coal which is being allocated to household use is particularly suitable for the production of gas and coke. Every ton that is consumed for household purposes is totally destroyed, and not more than one-fifth of its heating value is obtained, whereas, by its carbonization, two-thirds or more of its heating value can be distributed in the form of gas and coke, and the gas be used by the domestic consumer at a higher efficiency than the original coal. By utilizing the coal for gas and coke making, there would be no hardship to householders at the present time, in view of the fact that the great majority of homes in this country possess gas cooking and other gas-heated apparatus. Thus, by allocating to them British coal, they have in effect two strings to their heating bow in these times of great stringency; and their burning of British coal injures the capacity of the gas industry to render the best universal service.

The National Gas Council have interviewed the Mines Department, and have urged that District Committees should not allocate coal for household purposes which could be more advantageously used, and in the general interests of the community, by being carbonized for public purposes. They have also claimed that gas-works should be placed first on the British coal priority list which has been issued to collieries, instead of third as at present. There is, as already seen, good reason for this. Moreover, the gas industry throughout the unprecedented coal stoppage has not spared itself to serve the country; and the least the Government can now do is to help it by means within their power. Not only through the individual efforts of the managements of gas undertakings has the supply of gas been maintained, but there has been a considerable co-operative spirit through the industry by which gas-works well-placed have been helping others less fortunate. The result is that few works have been compelled to close down, though in two or three cases there are local authorities who have ceased to supply; being dominated by labour members, they have foolishly refused to purchase foreign coal, and are thus guilty of a dereliction of public duty. The National Gas Council urge that gas undertakings should not relax their efforts to obtain as much coal from abroad as is necessary to enable them to maintain gas supplies. The advice is very necessary. Winter is close at hand, with its peak requirements for solid and gaseous fuel.

The Final Offer.

THE best thing the Government can do now is to let the plan they made towards the end of last week be their final act in intervention in the coal stoppage. Every time they intrude into the dispute, it merely gives the Executive of the Miners' Federation the opportunity of urging the men to hold out longer, and a large proportion of the men obey—thus further protracting the stoppage. If the Government show that they have finished with the matter, then, if their Executive do not capitulate, the men will take affairs into their own hands, and what has occurred in Notts. and Derby, Warwick, Cannock Chase, Staffs., Lanark, and other districts, will take place in the remaining areas. District settlements will be effected; there will be a closer alliance between the owners and the men in each area than there can be under a national agreement; the national interests will be better served; and the power of the disturbing elements in the industry will be greatly diminished. The length of this strike has done the country incalculable financial injury, as did the one in 1921; but the present stoppage has proved to the men that the power of the central organization is subordinate to that of economic conditions, which must be a factor in regulating conditions within the industry.

There was little movement last week in the efforts to end the stoppage until the return of the Prime Minister from a much-needed rest, when he again took charge on behalf of the Government. The Miners' Federation, in the endeavour to check the trek of the men back to work, issued a manifesto which showed clearly that wages and hours have with them become a question of secondary importance, and that their primary interest is to save the national agreement, which is necessary to the existence and power of the Federation. This movement, like every other one the Executive of that body have lately made, shows the men that their misleaders have failed in, and have given up hope of, reaching the impossible objective for which they asked their dupes to leave their employment, and to live on a meagre allowance, for best part of five months. The miners, we should imagine, will be very chary to entrust their affairs again to men who have been found so sadly wanting in commonsense—men whose objects are more political than industrial. From them there has been no sign of sound statesmanship, of froth there has been an abundance, but of real fundamental support for their attitude there has been positively none. It has been a painful spectacle to see such muddlers entrusted with the handling of the affairs of over a million men. Even at the week-end, after what is tantamount to an ultimatum on the part of the Government, members of the Federation were still exhorting the men to resist.

Resist what? It is the cry of despair, because if the Executive agree to the proposals put before them on Friday night (after the Prime Minister and certain colleagues had spent practically the whole day, first in an hour's interview with the President of the Mining Association, and then several hours with representatives of the Miners' Federation), they know very well the power of the Federation and national negotiations will be things of the past. The new plan is more to the point than the hybrid proposal which was submitted to the owners and miners by the Chancellor of the Exchequer. That was an attempt to weld incompatibles, which the political mind thought was good, while the industrial mind knew that they could not hang together, that disaster would come the moment the attempt was made.

The offer of the Government puts to the test the question whether the Miners' Executive want peace, or prefer to do what they can to prevent a full resumption of work in order to preserve the authority of the Federation. The miners know now that they can get fair terms through district agreements; and this is assured them not only by the declaration of the coal owners in all districts that they are willing to observe the main principles that a national agreement would be designed to secure, but by the offer of the Government—"if the miners are at length ready to face the economic facts of the industry, and restart work on provisional district settlements," they "are prepared to secure by legislation that these principles are properly applied by means of a National Appeal Tribunal." This affords ample security; and the Premier states that it represents the limits within which the Government find themselves able to act. The official statement puts the offer in this form:

1. As soon as there has been a general resumption of work through provisional settlements arrived at by local negotiations, the Government will pass an Act of Parliament setting up a National Arbitration Tribunal, unless the earlier conclusion of a national agreement renders it unnecessary.
2. Either party to any provisional settlement which provides for working more than the old hours may refer to the tribunal for review any matter dealt with by such settlement, being a matter of a kind which up to July, 1925, was customarily dealt with by national settlements.
3. The tribunal shall confirm or modify a provisional settlement in respect of the matter referred to; and as from the date fixed by the tribunal every man affected by the award, and employed in any pit which works more than the old hours, will be entitled by law to receive wages in accordance with the decision.

The portents of the week-end were that the response to the new move on the part of the Federation representatives is not likely to be favourable; though it is probable that the moderate leaders will recognize that the Government have now gone to what is the extreme limit. The drift-back to the mines of so many men is another important factor. It is at the moment also a little doubtful what will be the attitude of the owners to the Central Arbitration Tribunal. They are asking among themselves why such a tribunal is required if the principle of district settlements is to obtain. The Tribunal, it seems, to us, should be merely a court of appeal in the event of any difference on a point of detail standing in the way of a settlement; also later, when the position has reached a normal level, should there be a change in economic conditions of a substantial nature, and revision of terms cannot be effected locally, the matter could be submitted to arbitration. In such an event, the Arbitration Tribunal might be as valuable to the owners as to the miners, for economic conditions shift both ways. However, if the Federation Executive will not accept this last offer, there is not the slightest reason why the miners themselves, through their local organizations, should not do so, seeing that it gives them full security. The threat that the miners in some districts will continue to resist may be by-passed; they will not stand out with the other districts in full working operation, and the men in receipt of pay equal to the value of the day's work. We repeat that, if there is not acceptance of the new plan, the Government will do well to leave the handling of the position to the owners and men in the districts.

The Primary Industry in Smoke Prevention.

ONE who is taking a prominent part in the fuel problems of this country, and has been doing so for some years, is Sir Arthur Duckham; and this is not on account of his interest in the provision of carbonizing and other fuel-employing plant, but because he is concerned over the waste and inefficiency of the burning of crude coal for heating, and therefore the spread of uneconomy in the country, with the accompaniment of grave evil to health and property. An address which he prepared, and which was read last Thursday at the Smoke Abatement Exhibition in Birmingham, is one of many evidences of this. In it, in concise form, he presented many facts which will be of service not only in promoting public interest, but to smoke abatement propagandists. The title of the address was "The Contribution of the Gas Industry to the Problem of Smoke Abatement." It is, however, something more than a description of the contribution of what the industry is doing; and we think that in one part, perhaps more, it will have an influence in stimulating the efforts of the industry, when there is release from dear and limited supplies of coal. It is a big problem—one represented by no less than close upon 40 million tons of coal used in domestic grates, and nearly double that quantity, when trade is good, in industrial operations, as the text and a diagram in the paper show.

Towards the end of the paper, Sir Arthur says: "There "can be no excuse for causing smoke." That is right where there is a proper co-ordination of the methods of heating, and use is made of the smokeless agents gas and coke. This is a point in which there is failure—in some places, though not in all—in the industry's propaganda methods. Its advisory work should have brought to bear upon it the technical considerations which will produce the largest economy for the customer. "There is nothing like leather," says the shoemaker. "There is nothing like gas for all heating purposes," many gas salesmen say. But if, in suitable dwellings and other premises, the coke-boiler is pushed more, for the general supply of hot water and for serving radiators, and gas-fires are installed for "topping" the heat to the degree required in rooms or for occasional use, the gas undertaking (which would supply the fuel for both purposes) would be conferring benefit upon its consumers by producing maximum economy in heating, while doing excellent business for itself. If gas alone was used for all purposes in a dwelling-house suitable for treatment by a gas and coke system, the gas bill might be unsatisfactorily high. If coke was used in the manner suggested, the gas bill would look more favourable, notwithstanding that there is another bill to pay for coke. A good discretion and technical knowledge are needed in such work. However, Sir Arthur shows that the gas industry has made good progress in its contribution to the solution of the smoke abatement problem. The gas industry, in fact, has in this respect done more than any other. But Sir Arthur points to still greater advances being effected as public interest is aroused in the injury wrought by the pollution of the air by smoke. When that interest is thoroughly aroused, he says, further action will be taken, and reforms instituted. But we are not altogether sure that the gas industry wants interest thoroughly aroused too speedily, if it means that gas undertakings would be deluged with applications for gas-consuming appliances, which might be embarrassing, despite the remarkable things our contractors for gas plant are capable of achieving. A gradual evolution in public opinion and conversion from crude to scientific methods will be more consistent with the gradual increase of gas plant and the capacity of distribution systems; and that evolution, as is freely illustrated by the address, is going on. At the same time, the proposal that the Government should give a little stimulus to what has been, and is being done, by granting permissive legislation to local authorities to make bye-laws in respect of the reduction of smoke from dwelling-houses would be an excellent proceeding.

It is, of course, difficult to show, in definite terms, how much the work that the gas industry has already done in supplanting smoke-producing coal by non-smoke-yielding agents has succeeded in reducing the pollution of the atmosphere. Sir Arthur cannot say what is the actual benefit. It is, however, plain that much has been accom-

plished, in view of the great number of gas-consuming appliances that are being used day-by-day—for cooking and providing heat for all sorts of purposes, without the production of smoke. As a matter of fact, large as is the cooking and heating business of the gas industry, there is comparatively little difference between the quantity of coal used to-day for heating purposes, and what was consumed (say) thirteen or fourteen years ago. For domestic purposes, in 1913, it amounted to 35 million tons; while in 1924, the quantity is put down, by one coal authority, at 33¾ million tons, which means that, since 1923, the reduction of crude coal burning in domestic service has been only 1¼ million tons, or 3·5 p.ct. In works and factories in 1913 the quantity consumed was 68½ million tons, and in 1924 66½ million tons—a reduction of only 2 million tons. Incidentally, it may be mentioned that Sir Arthur, in showing that the domestic consumer is a greater sinner than the factory chimney shaft, states that some 6 p.ct. of the total weight of coal used escapes from the top of the domestic chimney, while the smoke coming from the factory does not represent more than ½ p.ct. of the whole of the fuel burned. From these data, it is obvious that we must at present look for the gas industry's meritorious contribution to smoke abatement more in the fact that we have arrested a large increase in the pollution of the atmosphere, than in what we have done to reduce it. It is to be remembered that there has been a growth of population, a considerable extension of the number of houses, and therefore of chimneys. Supposing, therefore, gas and coke were non-existent as heat agents, how much worse would our atmosphere have been to-day than hitherto? Sir Arthur well illustrates this point by his references to what has been done in Birmingham. The Gas Department are selling upwards of 13,000 million c.ft. of gas a year, of which approximately 27 p.ct. is used in industry. Domestic heating and lighting, therefore, requires 9500 million c.ft. It is calculated that in the area of supply there are more than 100,000 gas-fires and 200,000 cookers and hot-water apparatus. It is, therefore, computed by Sir Arthur that the substitution of gas for coal in Birmingham alone has eliminated from the atmosphere some 30,000 tons of soot and 9000 tons of sulphurous acid per annum. In other words, the sootfall in Birmingham through the use of gas is 250 tons per square mile per annum less than it would be if the present industrial and domestic gas heating were carried on by coal. If this is what has happened in Birmingham, then it can be said conclusively that the same process of smoke reduction from what would have been without the aid of gas and coke is going on throughout the country; for the remarkable extension of the demand for gas for heating purposes has been a universal experience.

An unusually interesting diagram in the address is the one showing the average therms consumed per consumer in various towns. It is shown that of the group Birmingham leads the way, with an average of some 285 therms per consumer, and, as will be seen, Bournemouth (as a seaside resort) and Bath taking succeeding places. Other seaside resorts and spas have also excellent positions in the comparison, while Manchester and Glasgow occupy very low places in respect of averages. But high and low averages per consumer are subject to several factors to which reference is not made in the address. Naturally, an undertaking like Birmingham, which can boast of 27 p.ct. of the output being employed in industry among a relatively few consumers, have in that a demand which helps to carry their average therms per consumer to a very high peak. On the other hand, undertakings with a large number of prepayment consumers and a comparatively small number of industrial consumers have their average consumption per consumer considerably depressed. Then, again, popular seaside resorts and spas have a large number of consumers whose cooking and heating consumption, in ministering to the needs of visitors, would multiply by many times the consumption of an equal number of private residents in other towns. However, apart from these disturbing factors in the comparison, it is good business for any undertaking to raise the average consumption of therms per consumer per annum. The address was an excellent statement of our position in a great national reform; and it has directional importance for the future.

Public Lighting Expenditure.

MANY good things came out of the proceedings at the meeting of the Institution of Public Lighting Engineers at Newcastle-upon-Tyne last week. But one of the most suggestive points is the revision that, it is said, should be made in our ideas of responsibility for the lighting of the main roadways of the country. Those to whom the duty of lighting is confided are still largely guided in their ideas and expenditure by the state of affairs that existed (say) twenty years ago. To save ourselves from attack, it must be said that there are exceptions to what is an admitted condition. Mechanical traffic has given a new use and importance to our roads. At one time people who wanted to get to distant parts of the country always did so by railway; manufacturers used invariably to send their goods by the same routes. There has of late years been a considerable transfer of both forms of traffic from the railroad to the arterial and other main roadways of the country. This has been recognized in the accepted principle of taxing motor-cars of all descriptions for the purpose of a Road Fund, from which contribution is made to the improvement and maintenance of roads. That is sound, as good roads are essential for easy riding and minimizing the wear and tear upon cars. With all this extra traffic of modern days, it would be unfair for the community in an area to have to bear the whole expense of providing and maintaining suitable roads for its accommodation and service—the cars passing over the roads coming from, and going to, goodness only knows where, and not for the particular benefit of the districts through which they pass.

In his address to the Institution of Public Lighting Engineers, the President (Mr. R. Davison, Superintendent of Lighting of the City and County of Newcastle-upon-Tyne) spoke of many things affecting public lighting. He wants to raise more interest in this important service on the part of local authorities and ratepayers; and he desires a minimum standard set by the Government for street lighting. The Government are not likely to make such an ordinance; seeing that no minimum standard would suffice. There would have to be minima to suit all the conditions which exist in cities, towns, and rural areas. But the problem of the fast-moving and long-distance traffic of these times, which necessitates suitable roads, also claims suitable night illumination; and this subject projects prominently from the address. In connection with it, the President makes an important suggestion. From the large sums of money extracted from road users, he is of opinion that the latter should receive some consideration from the Ministry of Transport in respect of the lighting of highways. He feels they are entitled to this; and, in our opinion, so are the ratepayers of most districts whose roads are used for heavy motor traffic, and who have to pay for their adequate illumination. Mr. Davison very properly contends that it is not right that a roadway should be made safe for traffic during the day time, and insufficient consideration be given to its safety at night time. The suggestion is a good one. Perhaps the Institution of Public Lighting Engineers can induce the Association of Municipal Corporations and other bodies to unite with them in an approach to the Ministry of Transport to invoke an annual contribution from the Road Fund to the expense of making proper provision for the illumination of roads much used by the owners of cars. The operations of the new organization should include acts as well as annual conferences.

Hooliganism and Electric Cooking.

IT is clear that the Labour majority on the Woolwich Borough Council and their supporters—who are devotees of Communism—do not intend, if they can be sufficiently obstructive, to allow the residents on the Eltham Housing Estate to have fair play in connection with the desire of, at any rate, 313 of them to have the liberty of choosing for themselves whether they shall use gas or electricity in their homes. A meeting was arranged, as previously intimated in the "JOURNAL," by those who lately unsuccessfully petitioned the Borough Council to release them from the clause in their tenancy agreements which fetters them to the patronage of the electricity undertak-

ing. The meeting was distinctly called for those who had signed the petition, and any others who wished for the liberty sought. But it was rendered abortive by a considerable number of rowdies, who were there uninvited, and who, by the noise they created, prevented the carrying on of the proceedings. This is adequate evidence that a majority of the members of the Council and their outside supporters are not moved by the question of freedom for the Eltham tenants to purchase whichever agent for light and heat they deem best suited to their purpose, but by political principles and aversion to private enterprise. This supplies an excellent reason for Parliament applying the Newport clause (see *ante*, p. 536) to all electricity supply undertakings, so as to put an end once for all to this deprivation of the liberty of the tenants of local authority houses. The rowdyism that occurred at the meeting is not what high-minded Britishers call fair play; but it is of a piece with the attitude of the Council in refusing to allow the tenants to spend their own money on such necessaries as light and heat for cooking where they please, which action has driven many of them to the use of oil. We hope our electrical contemporaries will protest against these hooligan methods of suppressing the expression of public opinion regarding the electrical experiences of 313 of the tenants on this housing estate, and of trying to maintain forcibly the use of electric cookers. If our contemporaries do not do this, we feel certain that secretly they will feel not a little humiliated that those who wished to protest against compulsion in the use of electricity were unable to do so by the ruffianly methods adopted on this occasion. The meeting had to be abandoned; but not before some of the petitioners had succeeded in giving vent to their feelings regarding the costs which they have to incur through electrical operation, and which they cannot afford out of the wages they are able to earn. Figures such as 7s. and 10s. a week were quoted for electricity, which is absurd for a man earning (as one said he was) 47s. a week, out of which 14s. 3d. goes for rent, and 7s. for electricity, which leaves him 25s. 9d. for food, clothing, and other requirements of his family! We notice that the "Kentish Mercury" advises the tenants on the estate not to allow their efforts for freedom to be relaxed by the means adopted to prevent the discussion of their grievances at the meeting in question.

Our Next Number.

By the time subscribers receive the present issue of the "JOURNAL," the proceedings at the annual meeting of the Institution of Gas Engineers will have reached the third lap in their course. Our next number will be devoted almost exclusively to the publication of the papers and reports, together with a full account of the general business and discussions. As in previous years, this special issue will in itself constitute a volume; and throughout all parts of the world where gas supply obtains, it will be read and preserved for future reference.

Tankless Gasholder Risks.

Referring to the editorial article on this subject in the "JOURNAL" for July 21 last, an eminent constructional engineer (in a private letter) says that from the first he feared the results which have unfortunately occurred at Posen. In his opinion, it behoves those interested in this type of holder to take every precaution to watch such structures very closely, and night and day, as otherwise, he feels, we have not yet seen the last of such catastrophies. He has never been able to bring himself to a state of enthusiasm over this type of holder.

Suspect.

A Sunday paper states that, as a result of the large number of mansion fires which have broken out recently, City insurance companies are insisting on a rigid examination of electric light systems. The manager of one large insurance company says that many country houses were fitted with electric light fifteen or twenty years ago; and an examination of the wires at the present time invariably discloses dangerous flaws. "Very often the wires are absolutely bare of insulation, and the effect of a short circuit is disastrous. Thus the overhauling of electric lighting systems is important from an insurance point of view."

Fuel Costs and the Steel Trade.

The prospects of the steel and engineering trades would be good were it not for the serious problems of coal and coke costs and the future of the coal market. A Sheffield paper says "some firms have helped to clear the way by entering into coal contracts for twelve months on the basis of 1s. per ton advance—a course of procedure which was out of the question until the miners began to return to the pits. Some collieries are asking 2s. and others 3s. per ton advance; but, so far, there has been no acceptance at these figures." At the same time, the steel trades recognize that it is inevitable there will be a period of dearer fuel—dearer than before the coal stoppage.

Trade Union Laws.

It is understood that, at the annual conference of Conservative and Unionist Associations at Scarborough early next month, there will be upwards of 2000 delegates present. A subject which it is expected will receive considerable attention will be that of amending the enactments relating to trade unions. Some of the delegates intend to demand drastic alteration in those laws, mainly with a view to safeguarding the community against the disaster of another national strike. It is probable, too, that resolutions will be submitted urging Government measures for dealing with the political levy and picketing, while special emphasis will be laid on the necessity for strict regulations for securing a secret ballot before a strike is called. It is expected that the Premier, in an address to the conference, will make some announcement as to the intentions of the Government.

The U.S. Benefit.

It is not only the coal which is being imported to this country which is benefiting the producers in other countries, but that which is being exported by them to countries which formerly preferred the British product. A prominent coal owner in the United States says his firm has alone exported 3 million tons into areas where Great Britain formerly held the market; and he calculates that, as a direct result of the strike here, America has already obtained at least 10 million tons of new trade. There was recently a sharp upward movement in the rates for coal tonnage from the United States to this country. At up to 20s. for immediate loadings, values are higher than they have been since June. Among other troubles to which recipients of coal from abroad are being subjected are the congestion of shipping and the insufficiency of facilities for unloading. These are causing delays in delivery.

The Unemployed.

According to the registers of the unemployment exchanges of Great Britain, there were on Sept. 6 no less than 1,559,500 persons unemployed, which is 9741 more than the previous week, and 214,045 more than a year ago. This shows the grave effect of the coal stoppage on employment in other industries; and yet the Miners' Federation urge that the men in other industries should render them financial aid—to assist (this is not how the Federation put it) in intensifying unemployment throughout the country by prolonging the coal strike. The above figures are exclusive of persons who ceased work in the coal industry on account of the dispute.

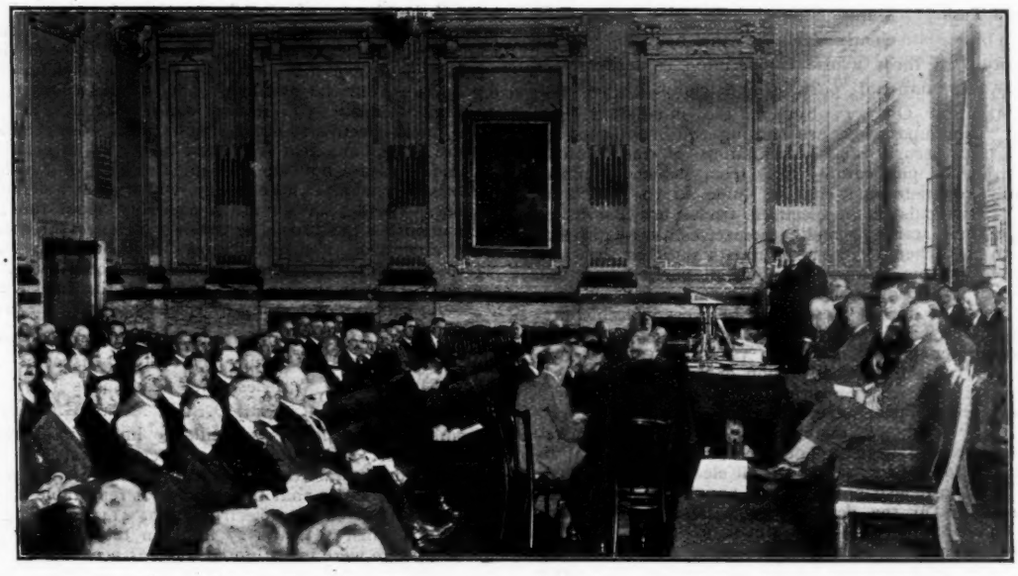
PERSONAL.

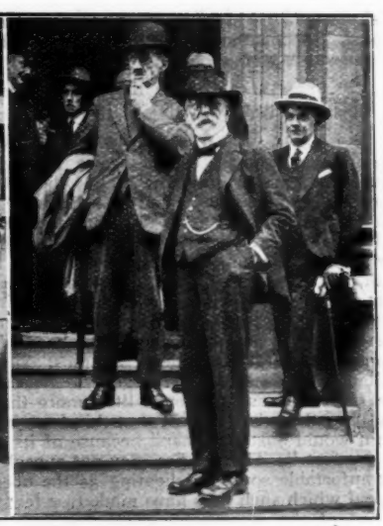
Councillor ARTHUR HENRY GLEDHILL, head of the firm of Messrs. G. H. Gledhill & Son, cash-till manufacturers, of Halifax, and prospective Mayor of Halifax for the next municipal year, has over 100 patents on record. His first patent was taken out when he was only 17 years of age, and was an apparatus for detecting a leakage of gas.

OBITUARY.

Mr. JAMES STENSFELD LONGBOTHAM, who died recently at the age of 48 years, was well known in the gas profession as a Director of Messrs. Jonathan Longbotham & Sons, Ltd., coal factors, of Water Lane, Sheffield. He spent the greater part of his life in Sheffield, and was for many years engaged in the coal trade of the city and South Yorkshire.

AT THE ANNUAL MEETING OF THE INSTITUTION.





The promptness of the "Topical" Press Agency, who completed their work in less than two hours, has enabled us to reproduce photographs taken at yesterday's opening of the proceedings at the Institution of Civil Engineers.

ELECTRICITY SUPPLY MEMORANDA.

The Great Push.

THE big campaign for "Wiring the Homes of Britain" seems to have been excellently planned on paper; but there is a doubt as to whether the promoters—the Electrical Development Association and the Electric Lamp Manufacturers' Association—were sufficiently early in the field to effect a proper boost-up of those whose co-operation is necessary to make it a real national push. The campaign is supposed to start on Oct. 1; but in the middle of September our contemporaries are urging all concerned to make a careful perusal and assimilation of the contents of the "E.D.A." publication No. 1000, which "affords a remarkably complete and concise guide to the whole of the plans." Principals in the electrical trades are also asked to encourage their staffs to make themselves thoroughly acquainted with the scheme. Some optimists say that the campaign definitely means big business for all participants, and that its success is already assured. All members of the trade "should" therefore devote themselves to every possible preparation for "Der Tag," which means Oct. 1, and only the "urgent need" for immediate action (says one of our contemporaries) warrants the recapitulation of the lines of assistance which local electricity concerns and traders in appliances should take. These lines were referred to in the editorial columns of the "JOURNAL" last week. Activity by all is required. They are also urged to get publication No. 1003, to show how to set to work to secure an all electric house by co-operation. There are also hints in this booklet as to how to keep interest alive in the demonstration houses. Here are samples: "Official welcome by the Mayor or other prominent citizen; a prominent local lady to open the home; prominent public or business people should be specially invited each day; architects, builders, and other tradesmen, who cannot attend during normal opening hours, should have a special view when the home is closed to the public; a broadcasting set might be switched on occasionally; tea, with electrically-cooked light refreshments, should be provided, at least on the opening day; free unit vouchers (for 10 KW.-H.) might be given—at the house only—to consumers taking certain apparatus on seven days' trial." The boosting of undertakings and traders, it seems to us, should have taken place weeks ago; and not have been left to the eleventh hour—if further homes of Britain are to be wired to any substantial extent as a result of a six months' push.

Probably Inopportune.

We rather fancy many local undertakings and contractors will consider they can have a local push at any time that is most convenient to themselves, and not engage in a national one at a fixed and inconvenient period—a period when there are difficulties with fuel, when it is not desirable to boost demand too much, and when the price of energy has had to be increased in many areas through the expensiveness of fuel. The higher cost of fuel is likely to run well into the winter; and the peak of fuel demand will coincide with the period of the electricity campaign. The fillip the Government gave electricity would perhaps in normal circumstances have made this "push" opportune for the industry; but the coal stoppage has produced a big offset.

Heating Rivalry.

We think it will be generally conceded that of the rival labour-saving methods for the production of heat, gas received the greater preference and praise at the Smoke Abatement Conference in Birmingham. That there is complete justification for this is obvious from the relative degree of popularity of gas and electricity for heating purposes, in both domestic and industrial operations. It was interesting, however, to find that Sir John Robertson, the Medical Officer of Health for Birmingham, made these remarks: "Gas-fires have played an important part in the reduction of smoke, but much improvement in their constrution is yet needed before they can compare with the open fire as a comfortable source of heat. They are, of course, economical and convenient in most situations. If electric radiators could be used for general heating at approximately the same cost as, or even a little more than, that of the open coal fire, there is no doubt that this form of heating a dwelling room would oust all others, because of its elasticity in use and its comfort." The gas-fire may not appeal to Sir John as such a comfortable source of heating as the open coal fire; but the appeal which such fires have made to a few million other people is one of the remarkable evidences that to them they are a comfortable and convenient means of heating, and are preferred to the coal fire for the purposes to which they are put. Moreover, people take different views as to what constitutes comfort. From the radiant heat point of view, the gas-fire is a good servant, with a permanent value; while a coal fire, having to be replenished with raw coal, is variable in its radiant heat service to a room. Comfort also includes the convenience of immediate use, without involving such labour as the carrying of coal and the making of fires, together with the resulting smoke, dust, and ashes, which provide dirty work for chimney sweeps, servants, or members of the family. Dr. Margaret Fishenden in her paper showed conclusively that electric heating can only be applied by those to whom cost is of no object; and there is very little chance of electric heating, in view of the poor potential heat value of a unit of electricity, ever coming down to the cost of an open coal fire. From that point of view alone, we have little fear that electricity will ever oust all other heating agents from the dwelling-rooms of this country, not even including "elasticity" in use and its "comfort." What is there in an electric radiator that is more comfortable than a gas-fire? Radiant heat is radiant heat. As to elasticity, electric radiators are built-up of elements, each of which is made for a fixed consumption of energy, which gives a definite output of heat. We do not see much elasticity about that; whereas one can turn a gas-fire up or down to meet requirement at any given time. Dr. Fishenden shows that electricity has a long way to go before it can compete with gas for heating. In fact, she submits that the cost of continuous heating with gas is high, but continuous heating by electricity is wholly prohibitive.

Fatalities in Factories and Workshops.

In considering the annual report of the Senior Electrical Inspector of Factories and Workshops (Mr. G. Scott Ram, O.B.E., M.Inst.E.E.), it must be remembered that he has surveillance in the industrial sphere and no other. But it will be observed that the limitation does not hide the fact that electrical operation is not without its dangers. He states that the number of reportable and notified accidents directly due to electricity was 414, including 24 fatal cases, as against 433, and 27 fatal, in the previous year. In addition, there were investigated some 25 accidents (10 of which were fatal), of which some were found to be non-reportable and others due only indirectly to the use of electricity—*e.g.*, to fire or explosion of vapour ignited by electricity, or to mechanical accidents caused by failure of electrical apparatus. Some 45 of the accidents (9 fatal) occurred on high-pressure or extra high-pressure systems; 37 of them (of which 7 were fatal) being in generating stations or sub-stations of authorized public supply undertakings. In carrying out work, including cleaning, on high-tension switchboards, there were 22 accidents, of which 6 were fatal. As usual, there were a number of fatal shock accidents—viz., 12 from low-pressure circuits—where the pressure of the shocks did not exceed 250 volts, which are the pressures found in domestic supply. All the fatalities occurred on alternating current, and were due to metal frame work of apparatus becoming charged, to portable lamps, to crane trolley wires, and other causes—one being a "practical joke." In this case, a wire was connected between a lighting switch and a door handle. A man taking hold of the latter was killed. As Mr. Scott Ram states, this is not the first time that this type of "joke," when perpetrated with alternating current, has had fatal results.

Danger of Alternating Currents.

A great deal of attention is given in the report to alternating current, and its increased danger compared with direct current. Not only are new supplies and extensions made on the alternating system, but many existing direct current supplies are being changed to alternating; and therefore Mr. Scott Ram is very emphatic in urging that electrical contractors, users, and others concerned should realize that installations which may be good enough for direct current may not be safe for alternating, and that additional precautions and better work and material are required with the latter for an equal degree of safety. This fact was recognized at the time the regulations were made eighteen years ago, as indicated by the exemption from many of the requirements of direct-current installations not exceeding 250 volts, but of alternating current ones not exceeding 125 volts only. In regard to special risks—*e.g.*, use of portable apparatus—certain requirements only apply in the case of direct current at pressures above 150 volts; but in that of alternating current, at any pressure. It follows that when electricity supply distribution systems are changed from direct current to alternating, many factory installations to which the exemption previously applied may no longer be in accordance with certain of the requirements of the code, and alterations are required. As this matter is of considerable importance at the present time, and as there are still to be found people (including some electrical engineers) who dispute the fact that alternating current at low pressure is more dangerous than direct, and some who even assert the reverse, it is desirable, the Chief Inspector says, once again to draw attention to the evidence afforded by the records of accidents. Within the last fifteen years, he points out, there have been 200 fatal electric accidents on factory premises from alternating current at low pressure—not exceeding 250 volts—and only three or four cases from direct current. These figures are sufficient to prove the contention that alternating current is more dangerous than direct current. At the same time, there is no doubt that there is still a preponderating use of direct current,

and that the number of reported accidents is, in consequence, greater from it than from alternating current; but the statistics prove that, notwithstanding the greater use of direct current, the fatalities from it are fewer than from alternating current. In the light of the figures submitted by Mr. Scott Ram, and in view of the fact that greater precautions are observed in accordance with the regulations in regard to alternating current installations resulting in fewer total accidents, there seems to be no room for any possible doubt upon the main question of the greater danger to life of alternating current.

Recent Fatalities. At the Ogmore Vale, Glam., Collieries of Messrs. Cory, a young man named Brynmor Edward John met with his death on the 24th ult. It appears that a wire fence had been erected round the colliery power station; and this was electrified at certain hours, owing to raids which had been made on the coal bunkers. The young fellow got inside the fence, and, slipping, his hand came in contact with the wire. The pressure was only 45 volts; but, not being in normal health, John met his death. Against the person or persons responsible for the electrification of the fence, a verdict of "Manslaughter" was returned at the inquest. A young labourer named May has been electrocuted at the West-End Brick Works, Northolt, Middlesex. He was working at the top of a clay pit, when he came into contact with a tube attached to an electrical compressed air engine. He received a fatal shock; and a comrade who attempted to rescue him also received a shock, and was badly burned. At the inquest on the 6th inst., a verdict of "Death from misadventure" was returned. While on an overhead girder at the works of General Motors, Ltd., at Hendon, a painter named Francis Graham was killed, owing to electric shock. At the inquest on the 26th ult., it was stated that the current was switched-on while Graham was near some wires. He received a shock, which caused him to fall, and fracture his skull. The Coroner considered that Graham's death was due to the negligence of an electrician. Through coming into contact with a live switch, Joseph Carter met with his death outside a cubicle in the extra high-tension chamber at the Halifax Corporation Electricity Works. At the inquest on the 26th ult., the verdict was that the man died from electric shock.

NATIONAL GAS COUNCIL.

Meeting of the Central Executive Board.

The Central Executive Board of the National Gas Council met on the 14th inst.—Mr. D. MILNE WATSON in the chair.

COAL POSITION.

The seriousness of the position in the coal industry was emphasized, and members were urged not to relax their efforts to obtain sufficient coal from abroad to enable them to maintain their gas supply. After a discussion of the situation, it was decided that the Mines Department should be urged to ensure that British coal for gas undertakings was not allocated by District Committees for household and other purposes, as was reported to be the case at the present time, and that gas-works should be placed first on the Priority List which had been issued to the collieries, instead of third as at present.

It was stated that, thanks in part to the way in which gas undertakings were coming to one another's aid, very few works had been compelled to close-down altogether. There were some cases, however, where local authorities had ceased to supply gas as a result of the refusal of their Committees to purchase foreign coal.

GAS (AMENDING ORDERS) RULES, 1926.

It was stated that (as appeared in the Council's report for July) the Board of Trade had issued new Rules to apply solely to applications for Amending Orders under section 1 of the Gas Regulation Act, 1920, for an increased standard or maximum price *where the application was based upon the increased cost of coal due to the stoppage in the coal industry.* It was the intention of the Board of Trade that, generally speaking, such Orders should remain in operation until June 30 next year.

ELECTRICITY (SUPPLY) BILL.

It was stated that the report stage of the third reading of the Bill would probably be taken immediately Parliament re-assembled. It was agreed that the progress of the Bill should still carefully be watched.

JOINT GAS AND ELECTRICITY COMMITTEE.

It was reported that a meeting of the Joint Committee representing the National Gas Council and the Institution of Electrical Engineers had been held on July 27, when it was stated that each of those bodies had approved the previous recommendations of the Joint Committee to the effect that it was desirable for the Joint Committee to hold an inquiry for the purpose of considering the possibility of closer co-operation between gas and electricity undertakings in promoting capital and fuel economy in the supply to the public of energy derived from coal.

It was stated that a letter had since been sent to the National Fuel and Power Committee, appropriate Government Departments, and other interested bodies, notifying the establishment of the Joint Committee, and offering to co-operate and assist the Government in any investigations falling within its terms of reference, and that appreciative replies had been received from the Prime Minister, the President of the Board of Trade, and the Department of Scientific and Industrial Research.

NATIONAL FUEL AND POWER COMMITTEE.

It was stated that the National Fuel and Power Committee, the establishment of which had been recommended by the Royal Commission on the Coal Mining Industry, had now definitely been brought into existence, and that the gas industry was represented thereon by Mr. D. Milne Watson and Sir Arthur Duckham.

REPORTS OF THE DEPARTMENTAL COMMITTEE ON THE LAW RELATING TO THE STOPPING-UP AND DIVERSION OF HIGHWAYS.

Members were reminded of the evidence given by Mr. Ogilvie on behalf of the Public Utilities Conference, together with Mr. Stilgoe (Chief Engineer of the Metropolitan Water Board), before this Committee on Oct. 6, 1925. It was stated that, after considerable delay, the report of the Committee had now been received. The gist of the evidence on behalf of the Public Utility Associations was that compensation should be given to sub-surface users in cases where they suffered damage owing to the fact that the roads under which their mains and cables were laid had been stopped-up. The Departmental Committee, in their report, expressed the view that the question of compensation was outside their terms of reference. There appeared no justification for this suggestion, and the question would be considered at an early meeting of the Conference of Public Utility Associations.

RAILWAY RATES TRIBUNAL—STANDARD CHARGES.

It was reported that the inquiry held by the Railway Rates Tribunal into the important question of standard charges for the carriage of goods and merchandise had now been concluded. Evidence on behalf of the National Gas Council had been given by Mr. Ogilvie before the tribunal on July 30; the gist of this evidence being that the rates for the carriage of coal and coke should be decreased. A verbatim report of the evidence in question had been circulated to members in the Council's monthly report for July.

STORAGE ACCOMMODATION FOR PRIVATELY-OWNED WAGONS.

It was reported that the Great Western Railway Company had recently endeavoured to impose a charge for privately-owned wagons of 6d. per wagon per day on wagons which remained on the railway as from Aug. 8, upon the ground that use of railway accommodation was being made by such wagons. The Council had immediately got into touch with the Federation of British Industries and the Association of Private Owners of Railway Rolling-Stock; and these bodies had agreed to resist the charge. A meeting with the railways was being arranged to discuss the question; and meanwhile members of the Council had been advised to refuse to pay this charge.

GAS METER PRICES.

A small Committee was appointed to meet representatives of the meter makers to consider this matter.

GUILDFORD CORPORATION ELECTRICITY EXTENSION ORDER AND THE NORTHUMBERLAND CLAUSE.

It was reported that in 1921 the Council took up a case on behalf of the Guildford Gas Company, and were successful in obtaining the insertion of the "Northumberland Clause" in the Electricity Order of the Guildford Corporation. The Corporation were now promoting an Order which proposed to repeal this clause; and the Gas Company were asking the Council to oppose the Order on their behalf. The Central Executive Board agreed that the case should be fought on behalf of the Gas Company.

WORLD POWER CONFERENCE.

It was reported that the first sectional meeting of the World Power Conference had taken place at Basle, and that Mr. Fottrell, representing the National Gas Council, was one of the official delegates. He had also deputized for Mr. Milne Watson upon the International Executive Committee. Mr. Fottrell reported that it had ultimately been agreed that another sectional meeting should be held in London in 1928 to consider fuel questions, and a draft programme formulated by him on general lines was accepted by the full conference, to serve as a basis for a detailed programme to be prepared by the British National Committee.

BRITISH ENGINEERING STANDARDS ASSOCIATION.

A request for a subscription from the Council to the above Association was referred to the Institution of Gas Engineers for their consideration and report.

CONTRIBUTION OF THE GAS INDUSTRY TO THE PROBLEM OF SMOKE ABATEMENT.

By Sir ARTHUR DUCKHAM, K.C.B., M.Inst.C.E.

[Paper at the Smoke Abatement Exhibition, Birmingham, on Sept. 16.]

On Sept. 16, under the chairmanship of Mr. C. F. BOTLEY, M.Inst.C.E., President of the Institution of Gas Engineers, a meeting was held at the Smoke Abatement Exhibition.

The CHAIRMAN, in calling upon Dr. E. W. Smith to read a paper on "The Contribution of the Gas Industry to the Problem of Smoke Abatement," by Sir Arthur Duckham, spoke of Sir Arthur's intimate connection with the gas industry, and his great general and technical knowledge of it. They regretted that at the moment he was not well, and hoped that he would soon be restored to good health.

THE PAPER.

At a conference on Smoke Abatement, it requires no elaboration on my part to stress the many advantages which would accrue from the abolition of smoke. You are all only too well aware of the disadvantages to health, the deterioration of buildings, the psychological, as well as medical, effect of the lack of sun, and the waste of fuel which results from the evil of smoke. These points the Smoke Abatement League are impressing on the public mind. When public interest is thoroughly aroused, further action will be taken, and reforms instituted. My object this afternoon is to show you what the gas industry has already done towards the abolition of the smoke nuisance, and to assure you that increased use of gas and smokeless fuel in the form of coke is the most direct remedy available.

In order to give a true perspective to the problem, it is necessary to state a few figures. The home consumption of raw coal amounts to about 180 million tons per annum. Of this quantity, about 40 million tons is used as raw coal for domestic purposes, 13½ million tons is used on the railways, and some 40 million tons is carbonized in gas retorts or coke ovens, or used under boilers to produce electricity.

Fig. 1 shows in diagrammatic form the proportion of the home consumption of coal which when burnt produces smoke. It will be seen that approximately 29½ p.ct. of the coal is burnt in a way which gives considerable smoke, 22½ p.ct. is burnt in a way that gives no smoke, and the remaining 48 p.ct. is utilized in a way which only gives a moderate amount of smoke.

Although a much larger amount of coal is used for industrial purposes than for domestic purposes, it must be borne in mind that the domestic fire is the chief producer of smoke. Approximately five-sixths of the total smoke comes from the domestic fire. It has been proved that, when coal is burnt under average domestic conditions, no less than 6 p.ct. of the total weight of the coal escapes from the top of the chimney in the form of soot, whereas from the average factory furnace only about 0·5 p.ct. escapes. Fig. 2 is intended to represent the proportion of smoke which comes from coal used for domestic and industrial purposes; and it will be seen that, whereas the domestic consumption of coal is much smaller than the industrial consumption, yet the percentage of the actual smoke produced represents a much greater figure—the reason being that it is easier to obtain proper combustion in the factory.

When coal is carbonized for the production of gas, gaseous and solid fuels are obtained which are both smokeless when burned. In addition to this, during carbonization one-third of the sulphur in the coal is distilled off with the gas, the remaining two-thirds being in the coke, with the result that the sulphur in the gas is removed during purification. The gas industry thus eliminates a very considerable amount of this undesirable constituent of coal, which would otherwise pass into the atmosphere.

BIRMINGHAM AND ITS GAS SUPPLY.

In order to give you a picture of the position that gas takes in modern industrial life, I propose in the first place to take as a typical example the city of Birmingham. Birmingham at the present time is selling over 13,000 million c.ft. of gas per annum. Of this quantity I understand that over 1000 million c.ft. are used for motive power, and more than 2600 million c.ft. for manufacturing purposes. Thus over 27 p.ct. of the output of the Birmingham Gas Department is employed in industry. This is a figure which shows the progressive spirit of the Birmingham undertaking, and of the industries which have seen the advantages to be gained from both the economical and the health points of view by the adoption of gas for industrial purposes.

It may interest you to learn of some of the industries in which gas takes an important part in Birmingham. Here are a few examples. One large firm, making motor cycles, sporting guns, rifles, &c., use for their heat-treatment purposes and forging over 200 million c.ft. per annum. Another firm, manufacturing lamps and other cycle and motor fittings, take more than 100 million c.ft. per annum. A third firm, engaged in the production of electrical apparatus, consume over 48 million c.ft. per annum. A manufacturer of a well-known food product uses over 19 million c.ft. per annum. Many other examples can be given; but it is sufficient to say that fourteen Birmingham firms account for 20 p.ct. of the total load of gas used for industrial purposes. It is only a matter of time and education before other firms must follow suit.

For domestic heating and lighting, there is a consumption of over 9500 million c.ft. per annum. It is estimated that there are more than 100,000 gas fires and 200,000 cookers and hot water apparatus at present in use in Birmingham. It may be interesting to see what this means in terms of smoke. By the substitution of gas for the coal which would otherwise be used for industrial uses, and for cooking and heating, it can be calculated that approximately 30,000 tons of soot and 9000 tons of sulphurous acid are eliminated from the Birmingham atmosphere each year, or, in other words, the sootfall in Birmingham by the present use of gas is 250 tons per square mile per annum less than it would be if the present industrial and domestic heating were carried on by coal instead of gas. The contribution of the gas industry to smoke abatement in Birmingham is a considerable item. This trend in the national life to use gas for heating and cooking in place of coal is rapidly developing in all parts of the country.

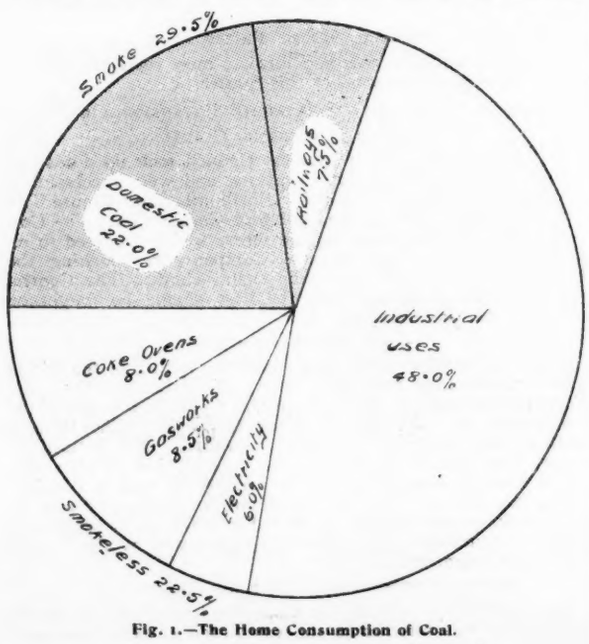


Fig. 1.—The Home Consumption of Coal.

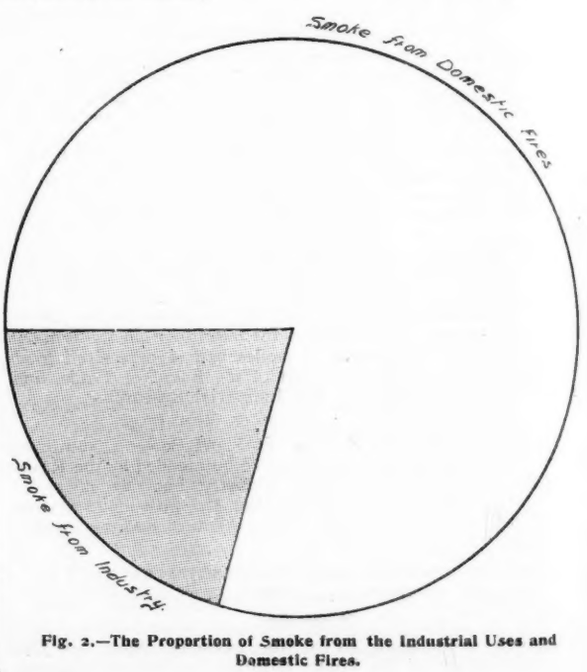


Fig. 2.—The Proportion of Smoke from the Industrial Uses and Domestic Fires.

In fig. 3 is shown the approximate consumption of gas per customer per annum. No more striking illustration of the contribution of the gas industry to smoke abatement can be found than in the fact that the large health resorts show some of the biggest consumptions of gas per consumer. In Great Britain, Birmingham leads the way with the figure of some 285 therms per consumer per annum; and it is followed by Bournemouth and Bath with approximately 250 therms per consumer. These towns can show a higher consumption per consumer than any of the large Metropolitan Companies or corporations situated in industrial areas. To the towns dependent for their income upon the maintenance of a clean atmosphere, as is the case of the health resorts and spas, it is essential that the use of open coal fires should be reduced to the minimum.

VALUE OF GAS IN THE HOUSE.

Town councils, architects, builders, and property owners are

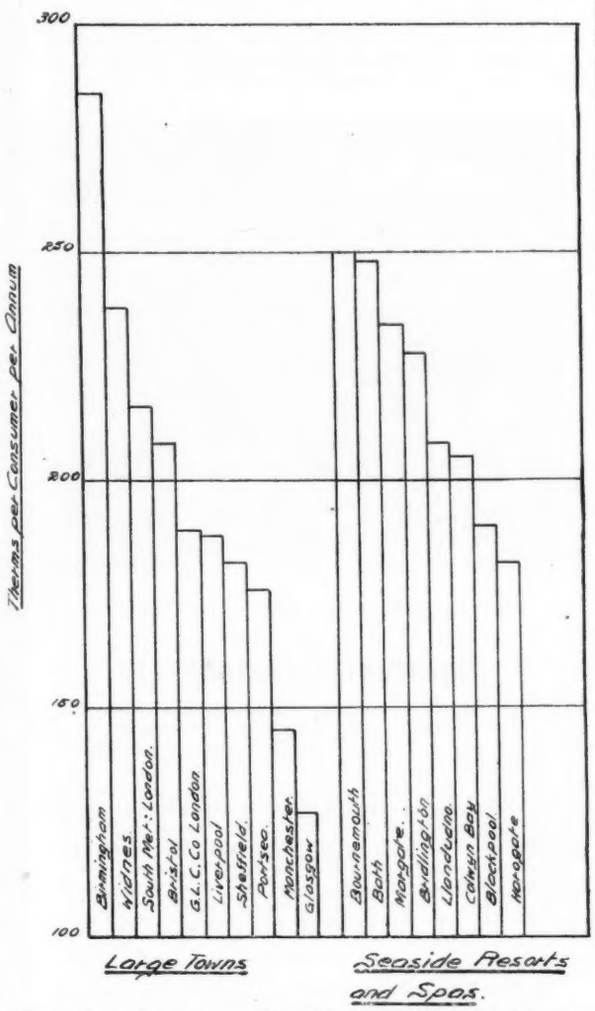


Fig. 3.—Approximate Consumption of Gas per Customer per Annum.

realizing the value of gas in the house, not only for the prevention of smoke and dirt, but because houses so fitted find better tenants, and are better cared for. A few examples from different parts of the country will show how general this tendency is.

In London the popularity of gas may be gathered from the fact that the number of fires, cookers, and so on, lent on hire by a single company—the Gas Light and Coke Company—is increasing at the rate of 80,000 a year. In the Liverpool building schemes in progress for the non-parlour type houses, the houses built by the local authority are being fitted with a gas cooker, gas boiler, and two gas fires, and are thus smokeless houses. The same principle is being adopted on many of the housing estates in different parts of the country. Thus, in Surrey one recent Garden City has been built with the intention that it should be entirely smokeless.

In Leeds, on one of the estates developed by the Corporation, the intending purchasers are given the opportunity of choosing either coal or gas fires; but "the hope is expressed—especially in view of the beautiful surrounding on the estate"—that there will be a general preference for gas, so as to minimize the smoke nuisance.

There is no need to labour this point; and it may be stated that there is a rapid changing-over to the use of gas for domestic purposes. One of the difficulties in the changing-over to the use of gas in the home has been the fact that houses have been built with the inefficient open coal-fired kitchen grate, behind which was placed the hot water boiler. In order to produce the hot water, the kitchen range required lighting, and therefore the cooking was in many cases carried out with the same fire. In recent years the gas industry has paid particular attention to this problem of hot water; and by the development of small efficient hot water boilers, working on either gas or coke, this problem has been satisfactorily overcome. It is interesting to note that in America, in which country anthracite, while plentiful, has been utilized for heating purposes, gas

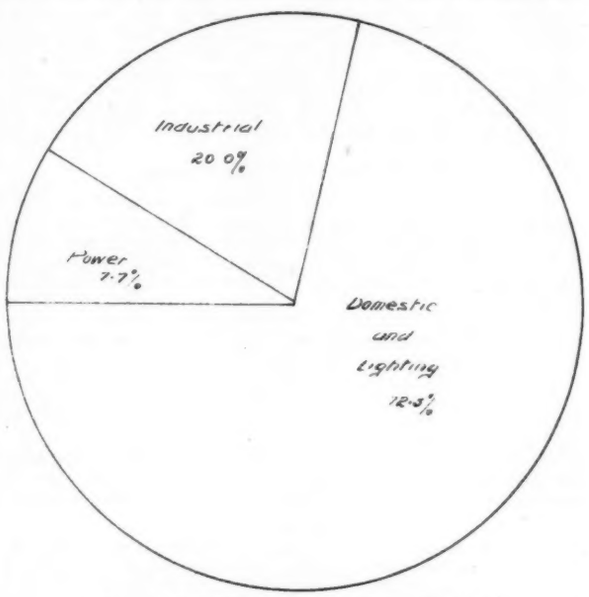


Fig. 4.—Distribution of Gas Sales, Birmingham.

is now being generally used, not only for water heating, but for the central heating of the homes—cleanliness and ease of control outweighing the higher cost of fuel.

For the satisfactory elimination of domestic smoke, the economic arrangement is for cooking and heating to be carried out by gas, and the general heating of water to be done by coke—gas being used when a continuous hot water supply is not required. The gas industry, as the producers of gas and coke, supply both requirements. The increase in gas used in the home is month by month having an effect on our atmosphere; and at the present rate of progress of the gas industry, many thousands of tons less soot is being emitted into the atmosphere each year.

THE PART OF COKE.

Up to now I have dealt largely with the utilization of gas as a means for the abolition of smoke; but no review of the subject of the part which the gas industry as a whole plays is complete without some mention of the important effects which follow the combustion of over 7,000,000 tons of solid smokeless fuel in the form of coke. In many industries coke plays an important part. Here, again, I will take Birmingham as an example, and will indicate a few of the trades in which coke is used. Large coke is employed in all branches of the metal trade, where a fierce heat is required for melting purposes, and also for glass blowing, bakers' ovens, steam lorries, and boiler making. This grade of coke is also most suitable for large type heating apparatus for public buildings and theatres, and is also used extensively as a fuel on river and canal steamers.

Small coke—say, 2 in. to 1¼ in.—is the domestic or household size. This coke, if suitably dry and of moderate ash content, burns well, and in the old-fashioned range gives a good supply of hot water. It is used in sweet boiling, grills, greenhouses, and many other applications. One-inch breeze is used for heating stoves of the enclosed or anthracite type, and for the large type of forge working. Bean breeze is the size generally employed for smiths' hearths, and in the manufacture of small chains. Coke dust is consumed as a boiler fuel, or for making concrete slabs for the building trade. Thus, it will be seen that every grade of coke from large to small finds its own particular application, and plays its part in the abolition of smoke. I am informed that, during the twelve months ended March this year, Birmingham sold practically all their make of coke, breeze, and dust locally, amounting to a total of nearly 400,000 tons.

One of the greatest difficulties which the gas industry has had to face in pushing forward its campaign for the abolition of the open fire has been the prejudice of the average Englishman in favour of the companionship of a coal fire. In two ways this has been tackled. First, in the artistic improvement of gas fires; and, secondly, in the study of the ways in which gas coke

can be cleaned and graded before delivery to the consumer, and the education of the consumer in the proper ways of burning it. Upon this subject of coke much work remains to be done. Birmingham has always been to the fore in dealing with it; and the fact that stocks of coke are usually lower there than in other towns, shows how well their methods of production and their propaganda have succeeded.

CENTRAL HEATING.

I would draw special attention to a simple development in domestic heating that can be applied where independent water heating apparatus, using either gas or coke, has been fitted or is about to be fitted. One or more radiators can be readily installed on the hot water system. Anyone who has lived in a centrally heated house will never go back to heating by means of a fireplace only. A fire is not needed, even in winter, until the evening, in a centrally heated house; draughts are eliminated; and certainly that family bugbear cold in the head or on the chest is greatly reduced. The cost of installation and running is low, the benefits and comforts to be gained are great.

NO EXCUSE FOR CAUSING SMOKE.

In conclusion, I would ask all people to consider for themselves this question of smoke nuisance. Because we are conservative, because we do not bother to understand, we, the inhabitants of the great cities, cause our own discomfort, and aggravate our own ailments. No raw coal whatever should be burned in any domestic fire. I would go further, and say no good citizen will burn coal in an open fire, or allow his food to be cooked in a range consuming coal. I cannot put the matter too forcibly before you. The remedies have been indicated and are to hand; the services of the gas undertaking are at your call; your problems are known, and have been solved; experts are available to advise and assist at any time. There can be no excuse for causing smoke.

I would ask each of you to take this cause to heart, and to do his duty as a citizen in teaching others how to prevent the production of smoke—that crime against our national welfare.

Discussion.

Mr. R. G. SHADBOLT (Birmingham) observed that the author had brought out the fact that, as a result of the use of gas, the sootfall in Birmingham was 250 tons per sq. mile per annum less than it would be if the industrial and domestic heating were carried out entirely by coal. He had been examining the results of work done by Prof. Cohen and a colleague, of Leeds, who gave figures for the sootfall in different cities and towns, including Birmingham. Two sets of extended observations made in Birmingham resulted as follows: In the centre, the figure was 483 tons of soot per sq. mile per annum; in the south-west, 71 tons. This showed an average of 277 tons; so that if they added the 250 tons per sq. mile per annum which would have resulted if coal only had been used, they would find that the progress made in Birmingham was no less than 47 p.ct. of the whole. Mr. Shadbolt advised a close study of local requirements with regard to the preparation and sizing of coke.

Mr. W. M. MASON (Manager of the British Commercial Gas Association) said that in his own house he never burned raw coal. He remarked that the figures in the paper proved Birmingham to be an outstanding example of what could be done with regard to smoke elimination. The total number of appliances—gas fires, cookers, &c.—made annually in this country was approximately 500,000. Every gas fire or cooker that was used ameliorated the smoke nuisance. He wished that everyone appreciated the good work which was being done by the gas industry in helping to solve this great national and communal problem.

Mr. F. C. BRIGGS (Dudley) urged that there was no reason why gas engineers should use coal for domestic purposes. At one time he had coal fires in his own home; but they were replaced by gas fires, with the result that the amount of cleaning of furniture and carpets had been enormously reduced. Gas meant improved health, greater cleanliness, and saving of labour. Every gas engineer should encourage the public to inform him of their needs.

Dr. C. M. WALTER (Research Laboratories, Birmingham Gas Department) emphasized the enormous amount of energy saved by the substitution of gas for solid fuel.

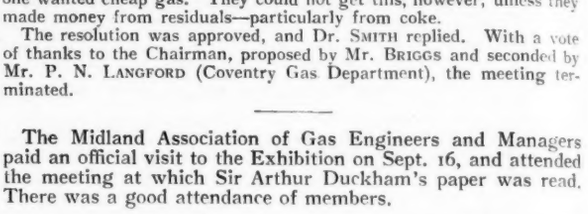
Dr. SMITH, replying on points raised in the discussion, said the question for them to consider was what was going to be done in the future. What more could the industry do than carry on the good work? As a matter of fact, a great deal could be done; and it was for the various technical associations to deal with the work. There was no question as to the justification of their advocacy of the increased use of gas for domestic purposes. Like Mr. Mason, he never used smoke-producing fuel in his house. Gas people should emphasize the fact that they used smokeless fuel. This would bring a great deal of conviction. Dr. Smith referred to the work of Sir Henry Gauvain, at Bristol, on utilizing ultra-violet light for the cure of rickets and consumption in children. He found that the treatment was much more effective when fresh air was circulated round the almost naked bodies of the children; Sir Henry was also a believer that there were other rays which were essential to the treatment. He had found that the effect of radiant heat was beneficial; and he desired to carry out experiments with children at his home, in a room in which fresh air was constantly circulated. There would be gas fires, or something equivalent, sending their warmth in every direction to the children while exposed to fresh air. What could be better than that the gas industry should assist and encourage such work? If the experiments were a success, then that kind of work would mean an enormous increase in the consumption of gas.

The CHAIRMAN said he had been impressed with observations as to the efforts they in the gas industry were making to reduce the price of gas. The cheaper it was, the greater would be its use. He saw that in a very striking manner as he went about the country. While they were efficient with regard to the production of gas, they must make an effort to be efficient in respect of coke for domestic purposes. He hoped that until they got in the position that they could supply gas at a cheaper rate, they would relax no efforts to supply coke of the best quality. The popularity of the gas fire was growing by leaps and bounds, and he believed that he was right in saying that the orders for gas fires placed with responsible firms this year constituted a record. He concluded by moving a vote of thanks to Sir Arthur Duckham.

The resolution was seconded by Mr. JOHN FOSTER (Chief Engineer of the Birmingham Gas Department), who pointed out that everyone wanted cheap gas. They could not get this, however, unless they made money from residuals—particularly from coke.

The resolution was approved, and Dr. SMITH replied. With a vote of thanks to the Chairman, proposed by Mr. BRIGGS and seconded by Mr. P. N. LANGFORD (Coventry Gas Department), the meeting terminated.

The Midland Association of Gas Engineers and Managers paid an official visit to the Exhibition on Sept. 16, and attended the meeting at which Sir Arthur Duckham's paper was read. There was a good attendance of members.



[*For photographs of other stands, see ante, pp.* 601-3.]

FORTHCOMING ENGAGEMENTS.

Sept. 23.—EASTERN COUNTIES GAS MANAGERS' ASSOCIATION.—Formal meeting.—28, Grosvenor Gardens, S.W., at 2.30.

Oct. 2.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Visit to Bath.

Oct. 5.—WALES AND MONMOUTHSHIRE DISTRICT INSTITUTION OF GAS ENGINEERS AND MANAGERS.—Meeting at Porthcawl (provisionally arranged).

Oct. 25, 26, 27.—BRITISH COMMERCIAL GAS ASSOCIATION.—Annual conference at Newcastle-upon-Tyne.

Nov. 12.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Meeting at the Hotel Cecil.

Feb. 16.—"B.C.G.A." MIDLAND DISTRICT CONFERENCE.

Sir John Cass Technical Institute.—The inaugural ceremony of the 1926-27 session will take place on Monday, Oct. 4, when Sir Charles C. Wakefield, Bart., will deliver the address.

Wales and Monmouthshire Junior Gas Association.—The first meeting of the Association for the 1926-27 session will be held at Bath on Saturday, Oct. 2. After inspecting the works of the Bath Gas Light and Coke Company, members will proceed to the Company's showrooms, where tea will be provided. Following this a general meeting will be held, under the Presidency of Mr. J. Wood, of Pentre, for the induction of the President-Elect, Mr. C. Bateman, of Bath, who will deliver his address.

Westminster Technical Institute.—For many years the Institute has worked in close association with the gas undertakings in and around London; and the possession of a staff of experienced teachers has rendered it possible to organize courses of study exactly adjusted to the requirements of the various classes of employees in the gas industry. The laboratories and workshops are equipped with the most modern appliances and apparatus, and make ample provision for the experimental and practical work required by students preparing for the various examinations. The 1926-27 session commences on Monday, Sept. 27; and the Principal, Mr. J. Stuart Ker, will be pleased to forward to intending students and others interested in the work of the Institute copies of the prospectus, containing full particulars of the courses of instruction, syllabuses of work, and fees.

INSTITUTION OF PUBLIC LIGHTING ENGINEERS.

ANNUAL CONFERENCE AND EXHIBITION OF LIGHTING APPLIANCES.

The Institution of Public Lighting Engineers held their third annual meeting and conference in Newcastle-on-Tyne on Tuesday, Wednesday, and Thursday, Sept. 14, 15, and 16, the delegates numbering about 130. The business portion of the programme was conducted in the Connaught Hall of the "Y.M.C.A." Buildings. A civic reception was accorded the visitors by the LORD MAYOR (Councillor Anthony Oates), in the Council Chamber at the Town Hall, following which his Lordship opened an exhibition of lighting appliances in the Concert Hall. This lasted throughout the conference. Owing to restrictions, a survey of the lighting of the city, which had been arranged, had to be abandoned; and the social part of the Monday evening concluded with the delegates attending a ball at the Oxford Galleries at the invitation of the Lord Mayor. On the mornings of Wednesday and Thursday business meetings comprised the proceedings, and on Wednesday there was also a luncheon at the invitation of the Lord Mayor and the Chairman of the City Lighting Committee (Alderman A. Wilkie, C.H., J.P.), on behalf of the City Council. This was followed by a visit to the Carville Power Station, Wallsend, of the Newcastle Electric Supply Company. After the inspection of the power station, the company were conveyed to Whitley Bay in Corporation motor omnibuses, and entertained at tea at the Waverley Hotel. On Thursday the delegates were entertained at luncheon at the Station Hotel, Newcastle, by the Newcastle and Gateshead Gas Company, after which a visit was paid to the Redheugh Gas-Works of the Company, at Gateshead. Before the conference on Thursday, the President, Mr. R. Davison, the Newcastle Lighting Superintendent, the Council, and a large number of members assembled in Eldon Square, where the President laid a wreath at the foot of the City War Memorial.

RECEPTION AND EXHIBITION.

The reception on Tuesday evening was held in the Council Chamber, where the LORD MAYOR extended a hearty welcome to the delegates.

On the motion of Bailie J. MACDOUGALL (Deputy Chairman of the Glasgow Watching and Lighting Committee), seconded by Mr. C. S. SHAPLEY (Leeds), a vote of thanks was accorded the Lord Mayor.

The LORD MAYOR, in response, said they had one of the best lighted cities in the country; but owing to the present industrial crisis, and the restrictions that had been imposed, they had not now normal lighting. Declaring the lighting appliances exhibition open, he said they had there various types of lighting of the greatest importance brought to the knowledge of every individual interested in the lighting of a city, borough, or town. He hoped that everyone attending the conference would add to his knowledge of lamps and lighting.

Mr. SHAPLEY proposed a vote of thanks to the Lord Mayor, and also to the manufacturers for co-operating with the Institution. The manufacturers in sending exhibits were spending money to show people what could be done by electricity and gas to make the streets of the cities and towns of this country safer for the pedestrian.

THE CONFERENCE.

The members assembled in the Connaught Hall on Wednesday morning, when the Lord Mayor attended to give the delegates a civic welcome. Mr. C. S. SHAPLEY (the outgoing President) was in the chair.

The LORD MAYOR referred to the formation of the Institution, and said it was a happy idea of Mr. Liberty and the Committee who worked with him at the outset to inaugurate an Institution of that nature to bring street lighting more prominently forward. At the exhibition which he opened the previous night he was struck with the great progress that had been made scientifically in the various lamps. Light was one of the great needs of all. It was an acknowledged fact that where there was more light there was less crime.

Mr. SHAPLEY, proposing a vote of thanks to the Lord Mayor, said there still remained a lot of work to do in connection with the Institution; but they had made some progress during the two years of their existence. He did not think they should lose sight of the fact that it was a waste of money to have a big police rate and a meagre lighting rate. They could not get good lighting without they paid for it. At Leeds, through improved lighting, they had been able to reduce the police force, and so had been spending in one way and saving in another. The Leeds lighting rate was 8½d.; and he would like to see that made a standard. On it a town could be efficiently lighted, provided the rateable value was not too low.

Mr. R. DAVISON (Newcastle) seconded, and said the Lord Mayor had been his right-hand man in getting things through the Committee for him. The Lord Mayor had taken a keen interest in the Institution since its formation.

A letter of apology was received from Alderman Alex. Wilkie (Chairman of the Newcastle Lighting Committee) for his inability to attend the conference through ill-health. The Mayor of Bournemouth wired his regrets that a business engagement prevented him being present.

A substantial list of new senior and junior members of the Institution was read by the Secretary (Mr. W. J. Liberty), and passed by the gathering.

THE NEW PRESIDENT.

Mr. SHAPLEY next introduced the new President, Mr. R. Davison, and said they needed the utmost interest taken in the Institution; and this could be brought about only by having new and live men to carry on their efforts. There was a lot of apathy throughout the country in regard to public lighting. They were unable to carry out research work like the manufacturers, to whom the members of the Institution bore testimony for their untiring energies to obtain the best possible results with the least consumption of power or fuel, as the case might be.

Mr. DAVISON briefly returned thanks for the honour they had conferred on him, and proposed a vote of thanks to the retiring President, which was seconded by Mr. S. B. LANGLANDS (Glasgow), and carried with acclamation. Mr. Davison then proceeded to deliver the following:

PRESIDENTIAL ADDRESS

OF

Mr. R. DAVISON.

At the outset, I wish to express to you all my sincere appreciation of the honour which you have conferred upon me in

THE PRESIDENT.

Mr. R. Davison, Superintendent of the City Lighting Department, Newcastle-upon-Tyne.

electing me to the position of President of this Institution. I assure you that I fully realize the difficulty of maintaining the high standard of Presidential Addresses set by my able predecessors. I am sure, however, that the subject I have chosen will command your interest and sympathy, for I wish to devote myself to an endeavour to stir up a more general interest in public lighting; and I hope that our consideration of this subject will inspire us with fresh enthusiasm for the great work which is our responsibility, as well as our privilege.

The progress of public lighting has been so gradual, its desirability and provision so much taken for granted, that the public generally has little idea of the degree of progress which has been made, or of the patient and painstaking effort and careful organization which have been necessary to bring it to its present level. Still less, it is safe to assume, has the public any imagination of the benefits which may accrue from further progress, or of the direction and extent of future improvements. Indeed, I am just afraid that we ourselves, who make

the subject our life's work, do not exercise our imaginations sufficiently. We need vision, as well as light.

INTEREST OF LOCAL AUTHORITIES AND RATEPAYERS.

Although the Institution of Public Lighting Engineers is only in its infancy, there is already abundant evidence to the effect that it is arousing the interest of the local authorities, as witness the attendance to-day of numerous representatives, in addition to lighting officials. This is an example of the civic spirit which has made British Local Government a thing of which the nation may justly be proud. That readiness to study detail, to master technicalities of a profession other than one's own, and to labour at committee work without display or publicity, shows an unselfish devotion to the public interest which is an inspiration to those, like ourselves, whose duty it is to serve the local authorities and, through them, the community. To these gentlemen, then, we extend a very hearty welcome, and trust that our meetings will add to their information, and stimulate still further their interest in the subject of public lighting. This is of great importance, as through these representatives we get directly into touch with the person who pays the bill and enjoys the advantages of public lighting—literally, "the man in the street." This much talked of, much sought after, and very elusive person becomes after nightfall the supreme object of our solicitude, although, ironically enough, the better we light his path the less conscious is he of our existence.

A splendid opportunity of arousing interest in public lighting matters might be secured if members of the Institution and members of local lighting committees were prepared to give a series of short talks on public lighting in various parts of the districts which they control. This would not only reveal to the public some of the more interesting features of an undertaking which, as I have said, they are inclined to take for granted, but would afford them the opportunity of stating their views regarding the lighting of any particular district, and bring them in closer touch with the lighting authorities. In this district lectures of local interest have of late years been an encouraging feature of the city's intellectual life, having been given under the auspices of the Free Libraries and those of the Municipal Officers' Association. Another and more ambitious series was given a few years ago, when the Newcastle-upon-Tyne Literary and Philosophical Society carried through with great success a full University Extension Course entirely by local lecturers. This is encouraging; but it is still a pity that the ordinary citizen knows so little of the communal activities of his city. How many could give other than the most meagre description of their city's power station, tramway shops, gas or water works, drainage system, or public lighting system? If we can only stimulate interest on the part of the general public, we shall have travelled a long way towards our goal; and co-operation in this endeavour with the representatives of the other municipal activities would, I think, tend to raise the level of intelligent citizenship, and secure for the municipal officers the great boon of an instructed criticism and discriminating appreciation.

PUBLIC LIGHTING AND ITS ADVANCEMENT.

Considerable advances have been made during the last few years in many public services; but street lighting remains practically where it was in 1914. This can be said with very few exceptions. You will probably ask the question "Why?" It is, no doubt, partly due to the war, which cut-out four years of progress, and by the necessities of the situation demonstrated the possibilities of restriction without apparent—I repeat apparent—injury to the health and prosperity of the community; and it is also due to the fact that authorities do not fully realize the benefit which adequate street lighting can give to the nation. We, as lighting officials, I feel sure, are looking forward to the day when the Government of this country will set a minimum standard for street lighting to meet local requirements. This is long over-due; and I would suggest that the Institution of Public Lighting Engineers work with this aim in view.

Street lighting is an important public service, and should be maintained in as up-to-date a condition as are other public services. Municipal authorities are to-day faced with the ever-increasing amount of fast-moving traffic, which requires adequate illumination for its safe movement. It should always be borne in mind that restriction and economy are not necessarily the same thing, and that increased illumination does not mean that lighting authorities would be involved in increased expenditure, as it is possible in many cases to obtain improved conditions of lighting, and at the same time effect a saving in cost. Results of this description have been realized in this and other cities; and I feel sure there are members of this Institution who would be pleased to give details of schemes which have been carried out.

It cannot be denied that it is the duty of local authorities to provide not only for the safe movement of traffic, but for all road users at night time; and I am inclined to think that if more illumination was provided on our roadways, it would probably result in these being more used during the hours of darkness. You will notice I use the word "illumination," and not "lamps." It should be made quite clear that a lamp is an instrument to illuminate the road or street, and not merely a point of light to indicate a turning or an obstruction.

In interior lighting we have progressed beyond the ages when a lamp shed a little circle of light upon a table, desk, or flight of stairs, and all else was in gloom, to the time when carefully graded illumination throughout the room or building is demanded; and in out-door lighting, from the days of the traveller carrying his individual lantern, to the examples of lavish lighting which we see in some of our big public squares and main thoroughfares. Between penury and lavishness there is a reasonable mean, which we should endeavour to reach for the comfort and prosperity of the community. How many elderly, frail, or nervous people are shut-up in their houses throughout the long weary winter evenings, by reason of inadequate sub-urban lighting? How many of the business streets of our towns lose their usefulness after nightfall? How many brightly lit business houses and places of recreation fail to attract customers because the route to them is poorly lit? Surely all this involves a direct injury to the wealth, happiness, and prosperity of the community?

PUBLIC LIGHTING AND VEHICULAR TRAFFIC.

Our generation has also witnessed another great change, the effects of which have not yet been fully realized or provided for. I refer to the greatly extended range and increased speed of vehicular traffic. The Ministry of Transport receive large sums of money from road users; and I am of the opinion that these people should have some consideration from the Ministry as to the lighting of our highways. At the moment, in this county, a main road is being constructed; but so far I have not heard any mention regarding provision for lighting. Surely road users are entitled to have adequate illumination, and should not have to depend upon their own lighting arrangements, which, as you know, are sometimes a positive danger to other users of the highways. In my opinion it is not right to make a roadway safe for traffic during the daytime, and leave the road users to their own resources at night; and I commend this important question to the members of the Institution for careful consideration.

One point I should like to make in this connection. In the course of a short journey, a car or motor lorry may pass from one municipal borough through the areas of several urban and rural district councils to another borough, travelling all the while (except when within the boroughs) upon a road provided and maintained by the county councils, possibly with the assistance of the Ministry of Transport. The lighting of the road is in the hands of the various local authorities. All honour to the parish councils who have adopted the Public Lighting Act (and I may be allowed a digression to remark that the desire for public lighting has been the germ of public activity in many a parish); but they cannot be expected to light the main through routes. I submit that some extension of county council or Ministry of Transport activities in this direction is desirable, and that the question of the capital cost, at any rate, of providing street lamps should be considered in connection with highway improvement schemes.

IMPORTANCE OF STREET LIGHTING.

The importance of an efficient system of street lighting cannot be overrated, as it not only makes the streets usable, but has a moral effect upon the population, and affords protection to both persons and property—thus tending to reduce the amount of police supervision required. It has been stated on many occasions that a public lamp is equal to a policeman; and I think you will readily agree that a public lamp is less costly.

When we are speaking of costs, just let us for a moment consider the cost of lighting this city, with its 260 miles of front and back streets, not counting the courts, alleys, and staircases. We find that the amount allowed for street lighting purposes for the financial year 1926-27 is equal to a lighting rate of 4·9d. in the pound on the basis of the recent new assessment; and if we take this figure a little further, it works out at 0·73d. per head of the population per week. Now, in face of the foregoing, can anyone honestly say that street lighting is receiving the support which it surely demands? It would probably be difficult to find an individual who was not prepared to pay double the amount per week, so that he could have adequate and efficient street lighting. It might be said, and it has often been suggested, that this city is too well lighted; but you do not hear of people complaining of having too much daylight, so why complain of too much during the hours of darkness? I will agree that this city is probably better lighted than many other towns of equal importance; but my main point is, not the amount of lighting in this city, but the manner in which public lighting is starved up and down the country. I appeal to the members of lighting committees in all parts of this country to take a real live interest in the lighting of our streets.

PUBLIC LIGHTING ECONOMIES.

It is impossible to calculate the blessings of good lighting in £ s. d., but there is no doubt that a considerable amount of money is expended on street lighting which could be made to bring a higher return. Just for a moment let us consider the question of automatic control for lighting and extinguishing. There are still a number of places where this system has not been adopted; and one can scarcely understand why the method has not been applied throughout the country. If it is a question of initial expense, it is surely an easy matter to borrow the

necessary capital, when the saving in the running costs will clear off the capital expenditure within approximately two years. It therefore appears inexcusable that in any district where there are even a small number of lamps an automatic control system is not adopted.

I have purposely refrained from dealing with technicalities of apparatus or organization in my remarks; for while I believe that the importance of the highest possible standard of these cannot be over-estimated, I wish to suggest that it is good to get the lamps and the lamp lighting out of our own "line of vision" sometimes, and to look round the field of our activities (which is far wider than we often realize) and imagine—extravagantly if you like—what could be done, think wisely and carefully what can be done, and then press forward to its realization.

The PRESIDENT was thanked for his address, on the motion of Mr. A. C. CRAMB (Croydon), seconded by Mr. J. F. COLQUHOUN (Sheffield).

IMPROVED LIGHTING OF SHEFFIELD.

By J. F. COLQUHOUN, Public Lighting Engineer.

To understand the steps subsequently taken, it will be necessary to give some indication of the position as I found it on my appointment as Lighting Engineer of the City in May, 1924. The price of gas in Sheffield is among the lowest in the country. Before the war it was as low as 10d. per 1000 c.ft. for street lighting purposes; and because of this a more generous use was made of gas in Sheffield than in most places in the days of flat flame lighting.

At that time the gas consumption of the lamps in the main streets was 24 c.ft. per hour. There were many lamps in certain places consuming 32 c.ft. per hour, and a few 40 c.ft. The flat flame burners had been discarded, and upright "Kern" incandescent burners were in use. In the main streets, the "Kerns" were in clusters of two or three, but in almost all cases only one burner of the cluster had been lighted since the war. The lanterns still in use in May, 1924, were made to accommodate the large gas consumption used in flat flame lighting.

The "Kern" burners and the lanterns were in a state of disrepair; repairs having been made reluctantly, and money spent grudgingly on them, as it was recognized that a radical change of the system was necessary, and sooner or later would require to be carried out.

There were in use 11,112 gas lamps, almost all consuming 4 c.ft. of gas per hour, and 287 electric lamps with wattages ranging from 60 to 500. During the war years, 150 lamps had been knocked down, and had not been replaced, and 1255 lamp standards were in existence, but were without lanterns, burners, &c. There were many roads still unlighted on which houses were built, and a large housing scheme was in a forward state of development; but no street lighting was arranged for, nor was there any sum put aside for that work in the annual estimates of the Department.

In reviewing the situation, I came to the conclusion that it would be unwise to propose to the Lighting Committee any large lighting scheme involving a considerable expenditure, as I recognized the difficulty the Committee would have in obtaining the necessary funds in the then depressed state of Sheffield's industries. I therefore recommended that 2-light preheater inverted burners consuming 3·5 c.ft. of gas, as against the 4 c.ft. per hour consumed by the existing obsolete upright burners, be, in the first instance, installed at the earliest possible moment, so that the saving in gas would pay during the current financial year for the cost of the new burners. This work was immediately put in hand; and by the middle of September of that year all the upright burners had been replaced by inverted.

It was necessary to re-set the volumetric governors fitted to each lamp; and I wish to take this opportunity of expressing my appreciation of the ready way in which the Management of the Sheffield Gas Company met my wishes and kept pace with my considerable requirements in the adjusting of the governors.

There were no means in the Department for testing the consumption of the burners or for measuring their lighting value; but immediately on taking up my duties, I asked for, and received, the authority of my Committee to purchase a test gasholder, test meter, minute clock, pressure gauges, &c., a mantle testing machine, and a lumeter, which form the nucleus of what I hope some day will be a fully-equipped laboratory, the lack of which I find a very great inconvenience. The lighting torches in use were not suitable for inverted lighting, and it was necessary to purchase acetylene torches, which have given entire satisfaction.

The substitution of the inverted for the upright incandescent burners made a marked improvement in the lighting of the city; and in consequence of that improvement, and the pleasure it gave the Street Lighting Committee, I felt that a proposal to re-light all the unlit lamps, to re-erect the lamps destroyed during the war years, to light the unlighted roads on which houses were built, and to make an endeavour to keep pace with the development of the new housing scheme, would be sympathetically considered by the Lighting Committee, the Finance Committee, and the general body of the City Council. The proposal was therefore placed before the Lighting Committee, and received their approval; and eventually a supplementary grant of £4000 was given the Lighting Department, raising the estimates for that year from £54,000 to £58,000. By the end of November the unlit lamps had been reconditioned and put into commission, and the lamps destroyed during the war years re-erected and put into use.

Meantime I had been considering the cost of electric street lighting. The charges made by the Electric Supply Department against the Street Lighting Department were, to my mind, high. My arguments for better terms were considered in a reasonable and sympathetic manner, and in July I was able to report to my Committee a reduction of over 25 p.ct. in the cost of electric street lighting.

Considerable economies were made in the administration of the Department, and it was found possible to do more than was at first expected with the funds at our disposal. By May 1, 1926, in addition to the gas lamps re-lighted, 714 new gas lamps had been erected, and the number of electric street lamps had increased from 287 to 1015—a total increase of 2697 street lamps in two years.

We were also able further to improve the lighting of the tram routes by substituting 3, 4, or 6 light (mostly 4-light) burners for the 2-light burners; and by the end of 1925 approximately 35 miles of tram route had been dealt with in this way. Most of the 4-light burners have oblong superheaters with nozzles placed zigzag fashion to prevent obstruction of light. In addition, 57 "Rochester" 6 and 8 light gas lamps took the place of a like number of old Graetzin lamps. We also found time, and funds, for the erection of a trial installation of electric street lighting of a tram route, half a mile of roadway being lit by 24 500-watt lamps. This installation was first put into use in November, 1925.

On May 1, 1926, Sheffield was lighted by:

Electric Lamps.

Vacuum, 60 watt	840
Gasfilled, 75 ,,	19
,, 200 ,,	5
,, 300 ,,	6
,, 500 ,,	143
,, 1000 ,,	2
Total	1015

Gas Lamps.

2-light burners, gas consumption 3·5 c.ft. per hour	10,745
3 ,, ,, ,, ,, 5·25 ,, ,, ,,	552
4 ,, ,, ,, ,, 7·0 ,, ,, ,,	1,576
6 ,, ,, ,, ,, 10·5 ,, ,, ,,	157
8 ,, ,, ,, ,, 16·0 ,, ,, ,,	51
Total	13,081

Owing to the rapid increase in the number of lamps in use, re-arrangements of the districts which each lamplighter locked after had constantly to be carried out. In this connection we found automatic clock controllers invaluable; and there are now 800 gas lamps and 682 electric lamps so controlled.

What is an appropriate sum to spend on public lighting must be considered by the requirements of each area; but I think it must be admitted that the lighting of our cities and towns generally does not meet the requirements of the case. The enormous increase since the war in the number of motor vehicles, and the speed at which they travel, have rendered obsolete the street lighting standard of pre-war days. The lighting of most of our main streets is such that motor vehicles must use headlights—necessarily glaring—to the great discomfort and danger of the citizens. This itself is proof that the lighting, however good according to the standards of a few years ago, does not now meet the needs of the case.

That street lighting is appreciated by the drivers of motor and other vehicles is beyond question. In a letter expressing the "very sincere appreciation" of the improved lighting of the tram and 'bus routes of Sheffield, the local representative of the Transport Workers said: "It is scarcely possible to overestimate the value of a well-lighted route to our drivers, the lessening of strain, and the minimizing of danger from accident; and we hope you will continue the good work so far as the limited finance will allow."

In the Scottish boroughs the provision of suitable lighting is a legal obligation. The Borough Police (Scotland) Act, and the Glasgow Police Act stating "That the local authority *shall* make provision for lighting in a *suitable* manner the portions of the turnpike roads within the city, and the public and private streets and courts."

There is no such legal obligation, so far as I know, in any English borough; and although there have been times when I thought that the phrase "suitable manner" with reference to street lighting was applied somewhat harshly by the courts against the City of Glasgow, I am now of opinion that the English boroughs might with advantage adopt the Scottish Act,

and assume legally the responsibility for *sufficient* street lighting.

Discussion.

Mr. LANGLANDS said Mr. Colquhoun had had an uphill job to improve the lighting of Sheffield; but he was a man of spirit and energy. An engineer must get over difficulties, and Mr. Colquhoun had got over them. The prominent thing in all lighting schemes was that they depended upon the terms that could be obtained for the supply of gas or electricity. There was a wide difference in prevailing conditions all over the country. Some places recognized that public lighting was the best advertisement that a town could have. He regretted that the Kern burner could not be fitted to the inverted type. It was a highly efficient burner. They could never drive a corporation or committee; but they could lead them, and the best way was by getting illumination in one area, and then comparing it with another. Traffic was what had driven them forward to good lighting. He concluded with a reference to welfare work, and advised them to take an interest in the recreation of the workmen, for they would be repaid by loyal service.

Mr. F. P. TARRATT (Newcastle) congratulated Mr. Colquhoun on the improvements that had been made in the lighting of Sheffield. When he was there in the early part of this year, he was greatly impressed with the improvements that had been made. It was impossible to get adequate lighting unless modern methods were adopted. He was glad the system of automatic control was to be extended in Sheffield. In Newcastle it had proved satisfactory, and his Company had also found it answered satisfactorily at Gateshead.

Mr. MUSGROVE (Sheffield), as one interested in the Gas Company, said he could fully bear out the statements Mr. Colquhoun had made. Mr. Colquhoun was fortunate when he went to Sheffield, in that anything that he did was in the nature of an improvement. Even before he arrived the Gas Company had endeavoured to do something to improve the street lighting. All that the Gas Company could not do, Mr. Colquhoun soon put in hand when he was appointed. Those who were behind the scenes admired the way in which he went about the job. In a few months a great transformation was made.

Mr. SHAPLEY said the Council at Bradford had considered that there was so much room for improvement there that Mr. Colquhoun had been called in to advise them in that city. This showed that the Institution was having some effect.

Mr. BRANSTON (South Shields) said that the lighting there was not efficient. The electrical department was in the hands of the Corporation, and the gas in the hands of a Company. They set one against the other, in order to get improvement. He put forward a suggestion that they should endeavour to get something from the Unemployment Grants Committee for the work of moving lamp standards where they were too close together and were wasting light. Some of the standards had been in since the commencement of the system of gas lighting. He strongly urged other authorities to make representations to the Government in this connection, so as to secure economy.

Mr. LEON GASTER (London) urged the need for determining a proper basis for street lighting. At present there was no proper definition of a well-lighted street. It was certainly necessary to induce public bodies to spend money on lighting.

Mr. JEPSON (Sheffield) suggested that an excellent medium for publicity work was the Rotary Club. It was a good thing to read papers on public lighting before sections of this Society.

Mr. THOMAS NEWTON (Hereford) mentioned that automatic control had effected economies, and had been in operation there for twelve or fourteen years. Streets should be classified; there seemed to be no uniformity.

Alderman DAVEY (Greenock) commented on improvements in public lighting in his town. They had adopted the pressure-wave system, which cost £8000 to instal, but on which they were saving £2000 a year.

Mr. COLQUHOUN, in the course of his reply, expressed the opinion that the standard for arterial roads should be such that motors could do without headlights.

MOTOR TRAFFIC IN RELATION TO LIGHTING.

By EDWARD FRYER, Deputy Secretary of the Automobile Association.

The Towns Improvement Clauses Act, 1847 (section 81), compels a person depositing material or making holes in a street to fence and light from sun setting to sun rising; but there is no compulsion on a lighting authority to provide efficient street lighting. It is permissive. I suggest, therefore, that we shall not get satisfactory highway illumination without some measure of compulsion. On the other hand, we cannot ask for compelling legislation until public opinion has been educated to require a minimum standard.

As a protest to the raiding of the Road Fund, at last year's conference I suggested it would be unfair to take any portion of the motorist's money for highway illumination unless we could have the guarantee that the lighting provided would enable the motorist to proceed without powerful headlights. For the purpose of carrying out experiments, however, so as to arrive at practical results, I see no reason why advantage should not be taken of section 6 of the Roads Improvement Act, 1925, which states that the Minister of Transport, at the cost of the Road Fund, may either by himself or through any authority or other organization approved by him, conduct experiments or trials—I quote from the Act—for the improvement of the construction of roads, or for testing the effect of various types of roads, or for testing the effect of various classes of vehicles on various types of roads, and may construct such roads and works, erect such plant, provide such accommodation, and, subject to the approval of the Treasury, incur such expenditure as may be necessary for the purpose.

Surely this gives all that is required at the moment; and as a means to an end I recommend that the City Council of Newcastle be asked by this conference to apply to the Minister to conduct initial experiments between Barras Bridge and the City Boundary, and that, when results justify it, the experiment be carried along the Great North Road through the County of Northumberland as far as Morpeth. Without some such definite action as this, what incentive is there to our inventors or manufacturers? With an incentive, I am sure the industry can provide a solution.

Either the local authority or the motorist should have to provide sufficient illumination to render travel safe. To-day the motorist provides sufficient for his or her own needs, the highway authority has to light obstructions, and the lighting authority provides what it considers sufficient—and in many cases not even that. Suppose we continue on this basis, the time may come when most road-users—including pedestrians, but excepting policemen and criminals—will be carrying their own headlights.

I believe that developments in connection with the lighting on private cars are to-day far in advance of the other and more important side—namely, the proper and efficient lighting of the highway. This is a matter which I leave in the able hands of the Institution of Public Lighting Engineers.

Discussion.

The PRESIDENT said that he would mention Mr. Fryer's suggestion to the Lighting Committee.

Mr. BALMFORTH (Bingley) thought that if the Automobile Association reported to Councils about main roads that were badly lighted, they would get better lighting.

Mr. L. GASTER (London) argued that the lighting of main roads should be the responsibility of the Ministry of Transport. If that body accepted the responsibility for making roads, they should also see to the lighting.

Mr. SHAPLEY (Leeds) contended that the Automobile Association were trying to shelve some of their responsibilities. As an Institution, they were not going to be dictated to by the Automobile Association. The Institution were going to throw a certain amount of responsibility on the Association. The lighting of towns so that motors could do without headlights was all right; but when it came to the main roads away from the towns, it was an impracticable proposition. It did not matter whether the road was lighted or not, there were people who would insist on walking on the road when there was a footpath. Headlights were necessary to meet the conditions of the road. He contended that petrol-filling stations at cross-roads were responsible for many accidents. The Institution could not accept the responsibility for the lighting of these points in order that the Automobile Association might sell petrol. If motorists had sufficient protection from the traffic on the road, there was no need to waste public money in attempting to light unoccupied areas.

Mr. T. NEWTON contended that the lighting of the highways so as to do away with motor headlights was more idealistic than practical.

Mr. FRYER pointed out that the Automobile Association were doing their part in creating signs, &c. They did not interfere with other people; but certain things, when reported to them, were dealt with on their merits.

LUNCHEON WITH THE CITY COUNCIL.

The members were on Wednesday entertained at luncheon on the invitation of the Lord Mayor and the Chairman of the Lighting Committee, on behalf of the City Council, at the Grand Assembly Rooms, Barras Bridge. The LORD MAYOR presided, and was accompanied by the Sheriff (Mr. Robert J. Thompson). After the Loyal Toast had been honoured, the Lord Mayor expressed regret at the absence of Alderman Wilkie, who was ill.

Mr. SHAPLEY proposed "Our Civic Authorities," and said the Institution was very much indebted to them for allowing their officials to go to conferences such as this. The Institution was doing very useful work, and greatly appreciated the hospitality of the city of Newcastle. He coupled with the toast the names of the Lord Mayor, the Mayor of Tynemouth (Councillor R. Irvin), and, in the absence of the Mayor of Bournemouth, that of Alderman John Gordon, of Liverpool.

The LORD MAYOR briefly acknowledged the toast, and thanked Mr. Shapley for kind allusions he had made to the city.

The MAYOR OF TYNEMOUTH said he was pleased that the civic authorities acknowledged the splendid work which was being done by the Institution. Good public lighting was a necessity; and he hoped the authorities would be long interested in the Institution's proceedings.

Alderman GORDON remarked that the way they had been received showed they were welcome. Nothing could have been better. He had attended the exhibition of lighting appliances, and was glad to note the improvements that had been made. At the "city on the Mersey" they had been experimenting for a long time, and gave the best they could in street and other lighting. He said to the Chairman of the Finance Committee in Liverpool: "If you give us £30,000, we can make a good job of it." He was told he would have to be content with £10,000, and make the best of it until the finances got into a better position.

Councillor E. J. CLARK (Chairman of the Lighting Committee of Leeds) gave "The Institution of Public Lighting Engineers." He said the Institution was doing a great work. It was a young body; and

when they realized what it had accomplished, it was all the more creditable to the members. As one of the delegates, he appreciated the hospitality extended by Newcastle. He thought something might be done to improve lighting in foggy weather. Investigation of this might be advantageously undertaken.

Alderman R. H. MILLICAN (Chairman of the Newcastle Watch Committee) expressed the hope that the delegates would return to their homes with pleasant recollections of Tyneside.

Mr. R. DAVISON, replying, said they wanted municipal authorities up and down the country to take a live interest in street lighting. The Institution was an infant, and required nourishment; and they looked to the civic authorities to give it that nourishment. If they could get the support of the Lighting Committees, the officials would not fail.

LIGHTING HOURS.

By R. BEVERIDGE.

When our Institution came into existence, and when others were concerning themselves for its welfare by thinking of the problem of its nourishment, I began casting-round for some form of employment on which to develop its youthful vigour, and raised the question of lighting hours. A small Committee conducted an inquiry into the procedure followed in all the larger towns, and reported that the outstanding feature of the information collected was the diversity in the prevailing practice. It was not considered advisable at that stage to make any attempt to devise a formula which could be recommended for general adoption, subject to geographical corrections; and the Council, when receiving the report, confirmed the view that the subject ought to be further ventilated. As no better opportunity could be found for directing attention to such an interesting subject or stimulating the interest necessary to attain progress than by intruding on this conference, I shall try now to present the case as briefly as possible—perhaps dropping a suggestion here and there, but leaving the question of future policy open for the present.

The first thing I have to do is to make the present position clear, and to describe exactly what is involved in the title of my paper. It will readily be admitted, I think, that the actual operation of lighting and extinguishing our public lamps is carried out with a wonderful degree of regularity; and I dare say it is assumed by very many people, if they ever give the matter a thought, that the time schedule which is observed must conform to a standard prescribed by some Act of Parliament. I was surprised, on becoming associated with the lighting service, that this was not so, and to find that each authority had constructed its own schedule. In London, for example, where there are many different local authorities, there are different time schedules, just as there are different ideas about other lighting matters. That a public service should have existed and developed as public lighting has done with such a degree of immunity from legislative control, is rather a fine tribute to the local bodies responsible for its management.

Granted, then, that each authority has been working on a time schedule which has satisfied the last generation, even if it differs slightly from that of the neighbouring authority, one may ask, "Why make any change?" The answer is that changing conditions are always apt to disclose weaknesses, and to point the way to improvement; and in any change from hand-lighting to a mechanically controlled system, one is directly confronted with a new problem, and the lighting schedule attains a new and a much greater significance. To take a homely example, we will imagine a small town with only a hundred gas lamps, which are hand lighted by one man, who gets round the lot in an hour. The time schedule, let us say, has been constructed to provide full lighting from an hour after sunset till an hour before sunrise. This arrangement, which is a very convenient one, conforms with the regulations applying to the lighting of vehicles (other than motor tail-lamps), but has certain objections to which I will refer later.

Meantime, we will assume this as our standard. As it takes an hour to light up, our lamplighter must commence at sunset, which is broad daylight, in order to complete his task by the prescribed time; and, as he begins extinguishing an hour before sunrise, his last lamp is extinguished at sunrise, again in full daylight. The actual lighted period for one night has thus extended one hour over the time prescribed by the time schedule for full lighting. This extra hour has caused a deal of worry, and still continues to furnish material for the alert critics, who are ever on the look-out for evidence of municipal extravagance and mismanagement. It has also attracted the attention of inventors, who have given us a selection of apparatus to secure as nearly as possible a simultaneous operation controlling lighting and extinguishing. We are not going to discuss the practical merits of these controllers, but will simply regard them as contributing a means to cut-out that period of extra lighting which we cannot regard, theoretically at any rate, as other than waste.

Having shown that by hand lighting there is nominally one hour's lighting to be paid for daily in excess of the period over which full lighting actually exists, and having indicated an alternative to wipe out this extra hour by a simultaneous operation for lighting and extinguishing, I must now tell you that this simple solution does not work out in general practice. It is just one of these things that happen so often where a theory or a principle seems absolutely perfect, and yet when tested is not the complete success it ought to be.

Perhaps I am incurring a certain risk of misrepresentation when attempting to describe what may be regarded as ordinary practice; but this must be set aside in order to find whether anyone has discovered a course reasonably approximating to a solution of our problem. Let us suppose we have found the individual responsible for the management of the group of one hundred lamps I spoke of, and let us charge him with pursuing wasteful methods, pointing out to him that one hour's consumption of gas nightly in excess of the prescribed limits for full lighting would mean a very substantial sum annually if thousands of lamps were involved, instead of only a hundred. What sort of defence would he put up, and how far could we accept it as valid? I imagine his first plea would be that he had found from experience that his time schedule was something in the nature of a compromise, and did not fall exactly in line with natural phenomena. He would insinuate that the excess hour of lighting nightly was not really waste—at least not every night in the year—and he would explain how the lamplighter's round had been so contrived as to ensure that the lamps on the more important thoroughfares would be the first lighted and the last to be extinguished, thereby mitigating the inevitable discomforts arising when the time schedule does not harmonize with a shortened twilight. While you were wondering whether it would be practicable after all to cut-out this hour of lighting, he would help you to a decision by telling you emphatically that it could not be done. By way of concession, he might go so far as to grant that, if provided with really reliable controllers, he might cut-off half an hour nightly, or even three-quarters of an hour; and he might cite individual towns where such margins are the established practice.

This form of defence, so far as it goes, is perhaps the best, and the only one, our culprit could advance; and seeing I have been the means of placing this victim in the dock, I think I ought to examine his evidence in detail, and see that a just verdict is returned.

(*a*) It is quite true that the time schedules which adopt the hour after sunset and the hour before sunrise are a compromise, because twilight and dawn vary with the seasons, and if a system of simultaneous lighting and extinguishing were operated on this schedule it would be found at certain times of the year that the lighting period was insufficient, and at other times that it was rather in excess of the requirements. The chief, and probably the only, objection to departing from this schedule is the anomaly which would be presented if the driver of a vehicle were summoned for failing to have his lights on at sixty-five minutes after sunset, and were to set up the defence that the local authority's lighting table provided for street lights being on as late as seventy minutes after sunset on that date. Of course, this little tangle could easily be straightened out, and probably will be some day, by providing that vehicles must light up if the public lamps are lighted on the thoroughfares through which they are passing, though this may be earlier than an hour after sunset; but the existence of unlighted street lamps would not be a competent defence for failure to light vehicles within that limit. That the tail-lights of motor cars must be lighted thirty minutes after sunset need not concern us, as this is for the purpose of identification rather than for considerations of traffic or safety. Nor need we draw any parallel with seafaring conditions, where sunset and sunrise are specified by law as the lighting and extinguishing hours respectively.

(*b*) It was part of the defence that the apparent excess in time, when lighting by hand, was not always surplus; and this has a certain foundation in fact. But, on the other hand, it is rather an admission that the time schedule as described does possess weak spots which require a discreet arrangement of the lamplighter's round, so that priority will be given to selected streets. It may well be that by a careful planning of our lamplighters' beats in this way it has been possible to give by the hand system a measure of efficiency which makes the task of superseding it by mechanical means greater than it has appeared. This is an aspect which is well worth thinking over, although it is only necessary to mention it here in passing. Let us get closer to the possibilities of the alternative provided in simultaneous lighting.

(*c*) We were given to understand that this would only reduce the period of full lighting by half an hour, or three-quarters of an hour at the most, per night, but not a whole hour. If this is the case, it must mean two things—first, that the old schedule for hand lighting was not a good one, and was only workable because of this priority arrangement; and, secondly, that with simultaneous operation with a sacrifice of only half an hour, or even three-quarters, the service, judged in the light of value received, must be much improved. Probably both explanations can be applied; but we need not turn aside to attempt to assess the relative degree of application. What I do wish you to notice is the absence of a specific forecast of the reduction of lighting hours resulting from the change to simultaneous lighting, also the suggestion of varying results in different places. This is very significant, because in the days when hand lighting was universal the expression "lighting

hours" was regarded as including the period required for lighting and extinguishing; and as this would vary in different towns, it could hardly be expected that these hours should be even nearly alike in different places. But when it comes to any system of simultaneous operation, this factor of uncertainty is eliminated, and we should be able to get down to something like a common standard affected only by geographical position. That is my whole argument.

There are two conditions the attainment of which seems to account for most of the changes in our human activities, and which serve as useful tests, whether these changes are to be accounted as progressive or not; and these are, a greater degree of precision in practice, and the gaining of results at less expenditure of time, money, or material. I have rather more than hinted that our schedules of lighting hours are not the models of precision they might be, that there may not be a great deal in the objections, but that, nevertheless, it should be possible to arrive at some common standard. Of course, I do not mean a schedule which would be applicable to all towns. That would be as bad as the case of a gentleman I know who bought a rather expensive sundial when away on holiday, quite oblivious of the fact that each sundial is constructed for a particular locality. But we could have a table which would represent the minimum lighting hours for (say) Greenwich, because the geographical corrections could be the more easily effected. These minimum lighting hours would assume simultaneous operations, and would have regard to the seasonal influence on twilight and dawn. If it did nothing else, it would furnish a useful datum-line by which one town could be judged as being generous or otherwise in the margin it allowed as compared with another, without the complication caused by the allowance of time for lighting. It would also establish a recognized schedule for the timing of mechanical controllers, bringing the use of such apparatus into its proper place in the scheme of public lighting.

And now, after I have had the temerity to attempt to conduct the diagnosis of this case, you are perhaps expecting me to commence at once to write out the prescription; but instead I am calling you all in as consultants, to help to decide first whether the case requires treatment, or whether the "lights" are functioning with sufficient uniformity as not to require interference. Should it be considered desirable to make some effort at modification, it is obvious that observations on a concerted plan and for this specific purpose would first have to be taken at different centres. When the observers were in a position to make definite recommendations in the form of schedules appropriate to their respective centres, these schedules would be modified by a geographical correction making them applicable to (say) Greenwich. If plotted on a chart, the resulting curves would be more or less identical, and it would be a simple operation to arrive at a mean or average, in the same way that a composite portrait is obtained by superimposing a number of photographic negatives.

And here, I think, it would be wise to leave the matter for the moment. My task, after all, was only to ventilate the subject; and its further pursuit is not a one-man job, but is obviously a case for co-operative effort, to be undertaken preferably under the direction of this Institution.

Discussion.

Mr. WINSTON (London) opened the discussion with the comment that rich boroughs could afford to have extensive time-tables. In some the anomalies were ridiculous. In London nearly all the boroughs had different time-tables, and often lamps on one side of a street would be alight while those on the other side were not; the reason being that they were in two different areas. The only solution was to have a standard time-table, preferably worked to by clock controllers. If they had a time-table for the rich boroughs, the poor ones would not agree to it. Then there was the uncertainty of the English weather, and the question of the half light after sunset and before sunrise. The only way to get a standard—and he did not think they would get it, because the councils would not agree—was for the Institution to submit time-tables for the North and the South to the councils concerned.

Mr. COLQUHOUN (Sheffield) said that, assuming there was legislation on the time of lighting, to whom was it to apply? Was it to apply to the boroughs and urban districts only, or to the whole country? If there was no time for extinguishing, it might lead to a diversity of lighting hours in the morning. How would it apply to the industrial areas where the atmospheric conditions were such as to require lighting at an earlier hour than fixed by statute? Another point which might arise in this case was: If the lamps were not lighted until the stipulated time, and an accident happened in darkness before the lighting time, who would be responsible? There would have to be some saving clause. The subject was bristling with difficulties; but this was all the more reason why they should tackle it. In Sheffield the estimated cost per hour for lighting was £5, and if an hour could be saved daily, it would mean a considerable amount in a year.

Mr. STEWART (Glasgow) agreed with having a standard time, but he did not favour an Act of Parliament. They were working to a scale in Glasgow, but at times it was found necessary to depart from that scale. Traffic was a factor, and this was heavier at twilight than at dawn. Geographical position and conditions of climate would also enter into the question of lighting hours. Lighting was certainly necessary half-an-hour after sunset and before sunrise, but climate would enter into the problem, and much would depend upon the class of street and the buildings in it. The Institution might collate data which would be useful in arriving at a conclusion with regard to lighting hours.

Mr. JONES (London) considered that information from the Department of Industrial and Scientific Research would be valuable.

Mr. BEVERIDGE, in reply, suggested that a quarter-of-an-hour after sunset was sufficient margin for the country. He did not suggest that there should be any more legislation on the question than there was at present. The Institution of Public Lighting Engineers should prove that they were capable of looking after matters of this kind. There was no reason why they should not depart from the standard time for lighting in regard to industrial areas, which were darker than the residential quarters.

STREET ELECTRIC LIGHTING OF LIVERPOOL.

By HAROLD DICKINSON, M.Inst.C.E., M.Inst.M.E., M.Inst.E.E.

The author gave a description (illustrated by photographs) of the more important electric lighting methods adopted for the streets of Liverpool.

Liverpool first made a trial of arc electric lighting early in the 'eighties; but as the experiment was not successful, it was soon abandoned, and it was not until 1896 that a real beginning was made. A large number of "Brockie Pell" arc lamps were erected in series of four or five, the supply of current being direct from underground mains laid solely for street lighting. In addition, a section of suspension lighting was undertaken at the same time in Bold Street, one of the principal shopping thoroughfares of the city. The arc lamps were suspended from galvanized steel span wires; and the overhead bare wiring supplying the lamps was supported between these span wires, and was run along the middle of the street. This was considered by the Board of Trade to be a serious departure from normal practice; and permission was only granted subject to the overhead wiring being replaced by underground cables at the first possible opportunity. That was thirty years ago. The installation still exists, the only change being in the lamp.

Little progress, however, was made after the first installation in a few of the main streets was completed, due no doubt to the fact that the gas lighting of the city was undergoing considerable improvement by the adoption of a new type of lantern. In 1922, however, the Committee responsible for the lighting of the city considered that, owing to the large increase in road traffic, both in density and volume, together with the greater speed, the time had arrived for the provision of greater illumination, and were strongly of opinion that the improvement must be carried out by means of electricity. With the urgent necessity for economy, the amount available for the purpose was very limited, and it was considered desirable to spread the improvement over as large an area as possible, rather than to undertake anything of an elaborate nature in a few thoroughfares in the centre of the city. It was therefore decided to deal with the main arteries; and the following figures will indicate the progress that has been made in this direction:

1922	Mileage of roads lighted electrically	10⅝
1923	" " " "	18½
1924	" " " "	38½
1925	" " " "	54⅝
1926 (present date)	" " " "	83¾

NEW OFFICIALS.

The results of the voting for officials of the Institution were made known at this point of the meeting. Mr. Alex. F. Cramb, Engineer and General Manager of the County Borough of Croydon, was appointed as President-Elect; and Messrs. S. B. Langlands, of Glasgow, C. F. Shapley, of Leeds, and C. J. Winston, of London, were elected to the vacancies on the Council.

On the invitation of Mr. John Christie, of Brighton, it was agreed to hold the next annual conference at Brighton.

Votes of thanks were passed to the Lord Mayor and Corporation for their hospitality; to those who had read papers; the President, officials, and members of the Council; and the manufacturers who had provided stands at the exhibition of lighting appliances.

LUNCHEON.

The members, together with the Lord Mayor, the Sheriff, and members of the Lighting Committee of the Corporation, were entertained at luncheon at the Central Station Hotel, on Thursday, by the Chairman and Directors of the Newcastle and Gateshead Gas Company; Mr. J. E. COWEN (the Chairman of the Company) presiding.

The CHAIRMAN proposed the toast of "The Institution of Public Lighting Engineers," coupled with the name of the President, Mr. Davison. He said there was no need for him to emphasize the importance of the work of the Institution. This was beyond question, not only as a public convenience, but also as it intimately affected the public health and the public morality of streets and towns. Public lighting was a subject which demanded—and he ventured to think was getting—the attention it should have from those responsible. The Institution was a young one, and was playing its part increasingly in assisting and advising public bodies on questions of public lighting. He was sure that in Newcastle they had lighting which was good and efficient under the care of the Lighting Committee of the Corporation. That Committee had been ably served by the Lighting Superintendent, Mr. Davison. The Institution did not regard this work from either the electric or the gas point of view. What the Institution and the lighting committees and the officials

had to do was to serve the people with the best public lighting, taking into consideration cost, convenience, and benefit to the public. Different districts might prefer different forms of lighting. He was very pleased that they had with them at the conference a number of members of the Newcastle Corporation; and he took it as a particular honour that the Lord Mayor, in his busy life, had found time to come to the luncheon. So far as the Gas Company were concerned, they had always had the most friendly and cordial relations with the Newcastle and Gateshead Corporations. In fact, they were on very friendly terms with all the public lighting authorities in the whole of their area. It gave the Gas Company particular pleasure that this year's conference should have been held in Newcastle, and that Mr. Davison should have been elected President. As they all knew, for many years before he became Lighting Superintendent to the Newcastle Corporation, Mr. Davison was an official of the Newcastle and Gateshead Gas Company, and his work and ability gained him the appointment of Superintendent to the Corporation, and Mr. Cowen ventured to think that the Corporation had no need to regret that appointment.

Mr. DAVISON, in reply, said they aimed at a cheap and efficient lighting system, which would be of benefit to the general community. He was pleased to think the Chairman of the Newcastle Gas Company was of opinion that the Institution was being successful in its endeavours. He (the speaker) had spent the greater part of his life with the Newcastle Gas Company, and was gratified to think that his services had been appreciated. The lighting committee were the people who could supply the money to light the streets; and he contended that three-farthings per head of the population was not sufficient to carry out efficient lighting. He was disturbed to think that one urban district council bordering on Newcastle had decided that there should be no public lighting during the coming winter season. One reason given was that they might have to pay a threepenny rate, and another reason was that if they could do without light in the war period, they could do without it now. This was a wrong way of looking at the matter.

The LORD MAYOR voiced the thanks of those present to the Gas Company for the bountiful way in which they had provided for the occasion.

Mr. J. W. ELLIS (Vice-Chairman of the Company) briefly responded.

VISIT TO THE REDHEUGH GAS-WORKS.

During Thursday afternoon, there was a visit to the Redheugh Gas-Works of the Newcastle Gas Company, at Gateshead. The visitors were accompanied by Mr. J. E. Cowen (Chairman), Mr. J. W. Ellis (Vice-Chairman), Mr. T. P. Ridley (Secretary and General Manager), and Mr. F. P. Tarratt (Engineer). On arrival they were divided into parties of eight, and left in charge of guides, who conducted them over the works and showed them the various processes. The works claim to possess one of the best-equipped horizontal retort houses in the country.

A vote of thanks was accorded to the Directors of the Company and the officials.

EXHIBITION OF LIGHTING APPLIANCES.

The lighting appliances exhibition which was held in the Town Hall, Newcastle, during the three days that the delegates were at the conference, contained many mechanical devices of considerable interest to those connected with public lighting.

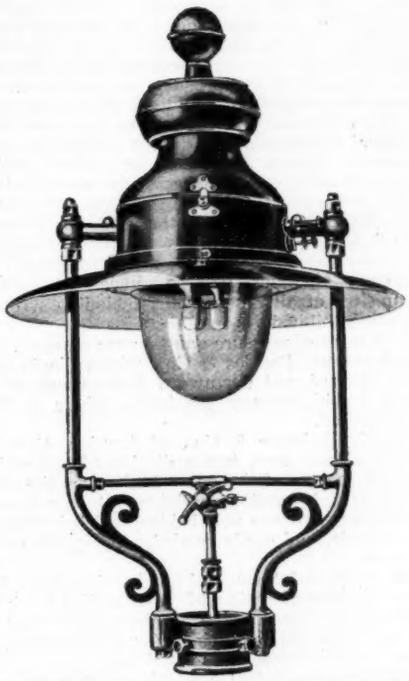
Messrs. Alder & Mackay, Ltd., of Edinburgh, had an interesting array of pressure gauges of varying sizes and patterns, as well as a number of pressure registers. Burners and lanterns embodying the latest improvements were conspicuous.

Mr. William Edgar, Gas Engineer and Contractor, of London, showed street lanterns; and there were on view many types, including cross-road danger signals. There were also conversion sets of neat design, and several patterns of wall lantern. In addition, there were exhibits of brackets, fittings, and globes for domestic purposes.

Messrs. Falk, Stadelmann, & Co., of London, exhibited gas mantles and burners; "Veritas" mantles being prominently displayed.

In addition to a well selected assortment of their square, circular, and hexagon street lamps of various patterns, together with burners, conversion sets, &c., Messrs. Foster & Pullen, Ltd., of Avil Works, Bradford, made a special feature on their stand of a new inverted lamp in **U** bracket, which represents an endeavour to combine the advantages of the inverted lamp with the accessibility of the square lantern. It remains, however, in all essentials an inverted lamp; and no use is made of burners or other fittings usually associated with square lanterns. The lamp has been designed to meet the requirements of a prominent superintendent of public lighting; and a great point about it is that the burner and all principal parts are immediately detachable for cleaning or repair. So far one size of lamp has been made, taking up to four No. 2 mantles; but other sizes will probably be available later.

The upper portion, or canopy, of the lamp casing is hinged, and may be opened in the usual manner. The hinge, however, is constructed in such a way that by a simple sliding movement the upper casing may be entirely removed, and just as easily replaced. When the casing is open, the burner may be lifted out. There is nothing to unscrew, and no close-fitting parts are likely to stick when the lamp has been in use. The operation of taking out the burner and putting it back can be performed by any unskilled person. The globe is supported by



Inverted Lamp in "U" Bracket—Foster & Pullen.

a perforated ring hinged to the outer reflector. The hinge is constructed in the same way as that on the casing, so that the globe may be simply opened or removed together with the ring if desired. The lamp body carrying the outer reflector and the burner regulation parts may be removed by unscrewing two cap nuts on the uprights of the bracket. Both gas and air regulators are absolutely positive in action; and the lamp as a whole is of robust and heavy construction, and likely to remain in good condition for an indefinite period with ordinary care. Lighting efficiency has, of course, been carefully considered.

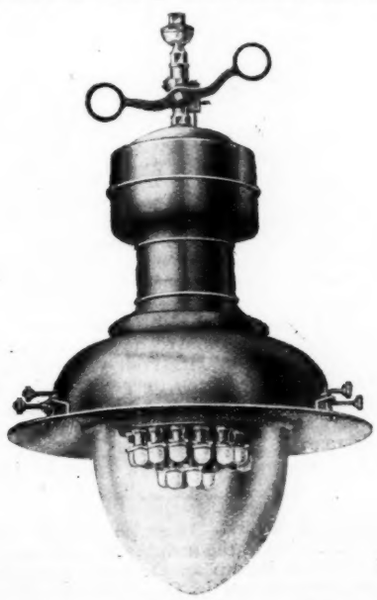
The Horstmann Gear Company, Ltd., of Bath, had a stall principally devoted to their automatic controllers. Their clockwork gas controllers are in a variety of designs, and can be fitted so as to light or extinguish all or a portion of the lamps at a given time. There were electric time switches also.

Messrs. G. H. Kempson & Co., of London, showed a variety of street lanterns, conversion sets, outdoor suspension lamps (some with parabolic reflectors), and indoor cluster lamps. Among other exhibits were various patterns of inverted burners, magnesia nozzles, shades, globes, and mantles.

Metropolitan Gas Meters, Ltd., dealt exclusively in meters.

Municipal Supplies, Ltd., of Edinburgh, made a speciality of their two and three lug magnesia inverted superheated burners. These burners are designed to consume any deposited dirt.

Messrs. W. Parkinson, of London and Birmingham, showed several new designs of street lanterns and burners. One of the latest lanterns is fitted with a burner which directs the light in



Parkinson "1100" Series Suspension Lamp.

a lateral direction as well as vertically. The arrangement consists of a 6-light burner fitted under the reflector immediately in the roof of the lantern, and a 4-light upright preheated type burner fixed independently and connected from the bottom of the lantern. To prevent the products of combustion from the lower burner interfering with the 6-light cluster, there has been inserted a Vitreosil cone which also acts as a reflector, giving increased lateral illumination. There is a separate control tap for each burner. Messrs. Parkinson have also introduced the metallization treatment of gas burners, for which it is claimed that the preheater and surrounding metals are rendered immune from the corrosive effects of the products of combustion. The "1200" series on **U** fittings for column lighting, the "1100" series, a suspension lamp, a fine range of Parkinson square lanterns, **U** fixing and suspension arc lamps, and lighting requisites of all descriptions, including wrought iron work, were also exhibited.

A number of types of pressure gauges were on exhibition from the works of Messrs. Peebles & Co., whose diaphragm lamp governor for upward and downward flow proved of interest. It is adapted for high-power gas lamps where a given consumption is required.

Messrs. A. E. Podmore & Co., of London, Gas Lighting Engineers and Contractors, had a display of gas and electric appliances. A feature of the gas exhibits was the dust-proof "Invex" burner. A novel lamp-lighter's ladder was also on show—the Davis patent one pole ladder, which is collapsible in the shape of a pole, and easily carried. There were a number of electric signs.

Messrs. W. M. Still & Sons, Ltd., of London, attracted much attention by the show of their all-British artificial silk inverted mantles specially hardened and strengthened for street lighting purposes. Spinnings and stampings for street lamps, as well as mountings, were included in the exhibits.

Messrs. William Sugg & Co., Ltd., of Ranelagh Works, Westminster, S.W., had a very complete and interesting exhibit. If a few of the fittings appeared to be ordinary, it was merely because they are so largely used as to have become a familiar sight. Indeed, the streets of Newcastle itself are very largely an exhibition of Sugg street lighting fittings. Included in the exhibit were two of the firm's "Windsor" square lamps—one with a hinged top—a six-light example of the upright "Littleton" lamp fitted with constant pressure governor, and a four-light model of the same lamp equipped with an auto-controller. A number of these four-light lamps are to be seen in use at Newcastle.

Then came an item of great interest to all public lighting authorities—the newly-introduced "Promenade" lamp, which has many of the advantages of the upright "Littleton" lamp—better appearance, greater freedom from shadows, and easier maintenance—and yet costs very little more than a square lamp. Examples were shown also of the "Littleton" and "Rochester" suspension lamps, both of which are coming more and more into use for street lighting, since they lend themselves to a variety of fixings—wall brackets, central suspension over roadways, tramway-standard brackets, and so on. A "Rochester" lamp was shown supported by such a bracket. With these suspension lamps, Sugg's patent distant control device, permitting control from the pavement or any convenient spot, is a great boon; and this device was shown fitted to the "Littleton" lamp, as well as separately and in section.

The "Promenade" Lamp—Sugg.

The exhibit included a full range of the firm's useful conversion fittings, a series of governors, a novel road direction lamp, and a selection of old-pattern flat-flame governor burners and other relics of historical interest.

MANCHESTER AND DISTRICT JUNIOR GAS ASSOCIATION.

Visit to the Morecambe Gas-Works.

The members, together with their ladies, visited the Morecambe Gas-Works on Saturday, Sept. 18. They were received by the Chairman of the Gas Committee, Councillor J. C. Wilson, the Gas Engineer, Mr. T. W. Barratt, and Councillor J. Holroyd.

The Morecambe Gas and Light Company, Ltd., was taken over by the Corporation in 1900. The gas sold then was 68 million c.ft. per annum. To-day it is 150 millions. Mr. Barratt took charge of the works in 1922, since when a progressive scheme of reconstruction has been carried out—new horizontal carbonizing plant of a capacity of 1 million c.ft. per day, new system of railway sidings, coal and coke handling plant, boilers, C.W.G. plant, &c. An illustrated description of the plant appeared in the "JOURNAL" for Feb. 17 last, p. 408.

The ladies went out into the town while the members were inspecting the works; and later the party reassembled for tea at the Winter Gardens, where they were received by the Mayor (Alderman A. W. Gorton, J.P.) and the Mayoress.

Mr. KNOWLES (Lancaster) moved a vote of thanks to their hosts, which was seconded by Mr. YOUNG (Burnley), who commented the Gas Committee upon their progressive Gas Engi-

Mr. BATTERSBY (Bury), President of the Association, complimented the Gas Committee upon their progressive Gas Engineer and Chairman..

Councillor WILSON and Mr. BARRATT replied to the vote.

Gas Undertakings' Return.—As we go to press, there comes to hand Part I. (relating to the manufacture and supply of gas) of the Board of Trade Return for the year 1925 relating to all authorized gas undertakings in Great Britain. This will be dealt with in an early issue of the "JOURNAL."

High-Pressure Gas for Laundry Work.

The Manchester Corporation have just secured the contract for the supply and fitting-up of an installation at the Convent of the Good Shepherd, Blackley, Manchester, of an important high-pressure ironing plant which will comprise a "Keith" patent rotary gas compressor, together with 72 "Keith" high-pressure irons of various sizes, with complete tube equipments. Most of the leading laundries and institutions throughout the country are now using this system.

Oil as an Enriching Agent.—Discussing in "Industrial and Engineering Chemistry" the progress of gas chemistry within the past half-century, Mr. W. H. Fulweiler (of the U.G.I. Contracting Company, Philadelphia) says there are a number of proposals for methods of utilizing oil as an enriching agent other than in carburetted water gas apparatus. One of these proposals is to crack the oil in tube units, thus producing gasoline and a fixed gas of relatively high heating value. It is claimed that by this system there is presented a greater net return, considering the present high market value of gasoline, than where the oil is cracked in the usual apparatus.

Temperatures in Gas Lines.—The United States Bureau of Mines have, according to Mr. E. L. Rawlins, writing in the "Journal of the Franklin Institute," completed a study of temperature fluctuations of natural gas flowing in unburied pipe lines, as compared with the temperatures in pipe lines covered with earth. Valuable data were obtained, which will serve as a basis for explaining differences in leakage rates from covered and uncovered lines, in so-called "breathing losses" in pipe lines carrying gasoline, and in correcting apparent errors in measurements of natural gas. While the tests were conducted only in one district, the data indicate the general effects of temperature variations in other parts of the country. Further study is needed to establish the exact depth of cover required to offset undesirable fluctuations of temperature under different conditions.

CERAMIC SOCIETY.

Meeting of the Refractory Materials Section at Leeds.

The Seventeenth Meeting of the Section was held at Leeds on Sept. 9 and 10, in the Chemical Lecture Theatre of the University. Mr. FRANK WEST, M.I.Mech.E., Chairman of the Section, presided over a large gathering of members and visitors.

It was announced that arrangements were being made for a visit to Czecho-Slovakia in connection with the spring meeting in 1927, and that the ensuing autumn meeting would be held at Bournemouth or Glasgow, according to circumstances.

INFLUENCE OF IRON OXIDE IN PROMOTING THE INVERSION OF SILICA.

This was the title of the first paper to be read, which was by W. J. REES, B.Sc. (Tech.), F.I.C.

A batch of commercial silica bricks supplied recently included some with dark spherical patches, evidently derived from iron inclusions subsequently oxidized. The bricks were very tough, and were well burned, as shown by the average powder density (2·34) of bricks with few patches. Analysis revealed no important differences except that the iron oxide ranged from 1·12 p.ct. in the normal brick material to 3·49 p.ct. in the dark brown portions, with a corresponding reduction in the silica content. Microphotographs showed that the bricks, which had been burned at cone 18 (this temperature being held for 36 hours), contained very little unconverted quartz, and the amount of tridymite present increased as the percentage of iron oxide increased. No indication of fusion was found in the ferruginous patches.

For coke-oven bricks it is probable that the advantages of greater tridymite formation might be offset by the effect of the iron oxide in promoting cracking of carbon monoxide and internal deposition of carbon in the bricks.

DRYING AND BURNING OF REFRACTORY MATERIALS.

The next paper was by FRANK WEST, M.I.Mech.E., and J. W. FAGAN, and dealt with "Practical Results and Experience in the Drying and Burning of Refractory Materials."

In the early part of their paper, in which the authors confine themselves to a description of the processes at the Friden Works, it is remarked that intelligence and skill are nowhere so surely rewarded as in the design and operation of the kilns to ensure that the wares shall be subjected to the correct temperature conditions for the necessary time to fit them for the requirements of the user.

The raw material at the Friden Works is a silica sand containing from 88 to 97 p.ct. of silica, which is made up with a silica clay bond in definite proportions. The finished goods are used in the construction of the combustion chambers of gas retort settings, the retorts themselves, and also for coke ovens. The goods are intended to withstand working temperatures ranging from 1200° to 1500° C. The stages of manufacture prior to drying and burning were dismissed by the authors in a few words. The material, after careful mixing and ageing, is pugged in a wet state and pressed into the several shapes and sizes. It is then ready for drying on steam-heated floors or in a tunnel dryer. The former consist of cast-iron plates or cemented tiles laid over pipes by which exhaust steam is circulated from the steam engines driving the machinery of the factory. Two or three years ago, direct firing of the tunnel dryer was abandoned, and the Uzallete system for the use of waste heat from the kilns was installed. It was designed by Mr. Twigg, of Manchester. In this system air is drawn through those kilns which are at a sufficiently low temperature, after burning, for the cooling to be accelerated. The air picks up heat from the kilns, and is then forced by means of a fan through the dryer tunnel. The first cost of the dryer tunnel and trucks was about £2070, and the cost of adding the Uzallete equipment with air mains, fan, and motor was £310. The saving effected by the application of the Uzallete system to the existing dryer tunnel is at least £300 per annum on fuel alone, while the kiln output, particularly in summer—when it is difficult to cool the kilns—has been speeded up, and the drying is cleaner and more easily regulated.

Compared, however, with the capital cost of the drying floors, roofing, and piping, that of the tunnel dryer is much greater per 1000 equivalent bricks dried in 24 hours; and the drying is much less costly with regard to wear and tear and power required. The main advantage of the tunnel is that it occupies much less ground area per 1000 bricks dried than the floors.

Many types of kilns have been built and tested from time to time, and it may be taken that the two types now in use have been proved to be most suitable for the purpose. They are the semi-continuous down-draught kilns built in benches, and the down-draught beehive kiln. In some of the former, induced draught is employed, and found a great advantage over the natural draught. One or two kilns of the beehive type are found to be extremely useful in the execution of small orders for urgent delivery. The tendency in modern carbonization practice is toward higher temperatures; and the manufacturer of refractories has been called upon to produce goods capable of sustaining temperatures far above those of fifteen or twenty years ago. The kiln temperatures have had to go up in sympathy. It is essential to burn-off refractories at temperatures above those at which they are to be used, to eliminate, as far as possible, any expansion or contraction after the working conditions have been reached. Kiln temperatures at Friden have been increased to an average of 1500° C. and over for the higher grade of silica goods.

On going through their records for the last nine years, the authors find that a marked improvement has been brought about, due, no doubt, to better supervision and the increasing use of scientic methods of operation and control. Their results on burning alone, while improving the quality of goods produced, show about 11 p.ct. increased efficiency on the average within this period.

REFRACTORY LININGS FOR CEMENT KILNS.

Then followed a paper on this subject by Dr. GEOFFREY MARTIN, who said that the rotary kiln in general use is lined with firebricks. In the wet process (usually followed in this country) a finely powdered mixture of clay and chalk (or limestone) containing about 40 p.ct. of water is charged at one end, while powdered coal is burned at the other end. The raw material becomes dried during the first 60 to 70 ft. of its travel, and this drying zone of the kiln may be lined with ordinary firebricks, which are protected from the direct action of flue gases by adhering layers of mud. These bricks must be mechanically strong, and not very porous, to resist the action of boiling water or steam, &c. A 4½ in. lining of brickwork is usually sufficient here, but in some kilns the bricks are substituted for a mixture of one part of ordinary cement and two parts of small cement clinker, gauged with water, and left to set.

The next 30 ft. constitutes the preheating zone, in which the clay loses its chemically combined water. A good type of dense, non-porous firebrick is all that is necessary here, though it is usually made 6 in. thick, because of increased abrasive action and higher temperature.

In the next 50 ft.—the calcining or decarbonating zone—the carbon dioxide is expelled from the calcium carbonate, leaving calcium oxide (quicklime) intimately mixed with the disintegrated clay products. Bricks with a very high silica content are not suitable for resisting the corrosive action of heated lime. Good fire-resisting bricks about 6 in. thick are used, containing about 31 to 33 p.ct. of alumina, 61 to 62 p.ct. of silica, with 3 to 4 p.ct. of iron oxide and trifling amounts of lime and titanium oxide.

In the next 40 ft., the clinkering zone, where the temperature reaches its maximum, the free lime combines with the silica and alumina present to form the components of the cement clinker. Here the firebricks, usually 9 in. thick, may last from three weeks to nine months, and the lining can be destroyed in a few minutes by neglect on the part of the burner. Good hard firebricks known to have given good results had the following percentage compositions:

—	Alumina.	Silica.	Ferric Oxide.	Titanium Oxide.	Lime.
1	33	58	4·5	1·0	0·7
2	43	49 to 50	3 to 4	2·0	0·7

Good results have also been obtained by using alternate layers of high alumina bricks and low alumina bricks. In practice, the too rapid corrosion of the bricks is kept in check by incrusting the surface of the bricks with a layer of cement. Sometimes cheap bricks of apparently poor quality have given better results than bricks much superior so far as a technical chemist could judge. This may be connected with differences in the burning and feeding operations. Clinker linings have been found to work well. The chief drawback is that, if a kiln is left to cool down, the clinker lining splits-off clean from the bricks, and the kiln has to be relined before starting again. The relining can be completed within 48 hours.

INFLUENCE OF FOREIGN MATTER ON THE THERMAL EXPANSION AND TRANSFORMATION OF SILICA.

This subject was considered on the second day of the meeting in a paper by J. F. L. WOOD, M.Sc., H. S. HOULDSWORTH, D.Sc., and Prof. J. W. COBB, C.B.E., B.Sc.

The authors investigated the effect of various materials on the nature and magnitude of the reversible thermal expansion of the bricks. The raw quartzite used was from Bwlchgwyn (North Wales), a material largely used for making silica bricks. The quartzite contained 97·60 p.ct. of silica, 0·32 p.ct. of alumina, 1·40 p.ct. of ferric oxide, 0·33 p.ct. of lime, 0·23 p.ct. of alkalis, and 0·14 p.ct. each of titanium oxide and magnesia. All the material passed through an I.M.M. 100-mesh sieve, 44 p.ct. passed through 200-mesh, and a further 11 p.ct. through 150-mesh. The added substances included boric acid, borax, phosphoric acid, calcium phosphate, and several other phosphates; chlorides of sodium, potassium, lithium, calcium,

and iron; carbonates of sodium, potassium, and lithium; sodium sulphate, silicate, tungstate, and molybdate; potassium chromate, ferrous silicate, ferric oxide, magnesium oxide, lime; and the minerals borocalcite, potash mica (muscovite), biotite (magnesia mica), and potash and soda felspars. For all but a few of the tests 2 p.ct. of the substance was added to the quartzite, precautions being taken with a view to making the test pieces as uniform as possible in composition and structure. The test pieces were fired at cones 9, 12, and 14.

Specific gravity, porosity, and reversible thermal expansion, as well as refractoriness, were determined in each case, the result being shown in tables or in graphs. The specific gravity determinations gave no indication of materially increased conversion of the quartz as the result of adding other substances. A few mixtures showed a decrease in porosity with increased firing temperature, possibly due to surface forces arising from formation of a little molten glass.

Refractoriness was not impaired seriously (not more than two cores) except by the addition of 10 p.ct. of borocalcite, though 4 p.ct. of this substance had no serious effect.

The reversible thermal expansion, compared with that of similarly treated specimens containing 2 p.ct. of lime, showed that boric acid, potassium carbonate, potassium chloride, potassium chromate, biotite, soda felspar, lithium chloride, ferric oxide, and borocalcite, each facilitated the conversion of the quartz. The specific gravity was not always an indication of the reversible thermal expansion.

It is intended to investigate further the influence of the more promising of the materials already tried, used separately, and also mixed together, on the reversible thermal expansion and after-expansion of quartz, when the test bricks are made under manufacturing conditions.

REFRACTORIES IN THE GAS INDUSTRY.

This was the title of a paper by W. T. GARDNER, which appears on p. 664 of this issue of the "JOURNAL."

MODERN CLAYWORKING MACHINERY.

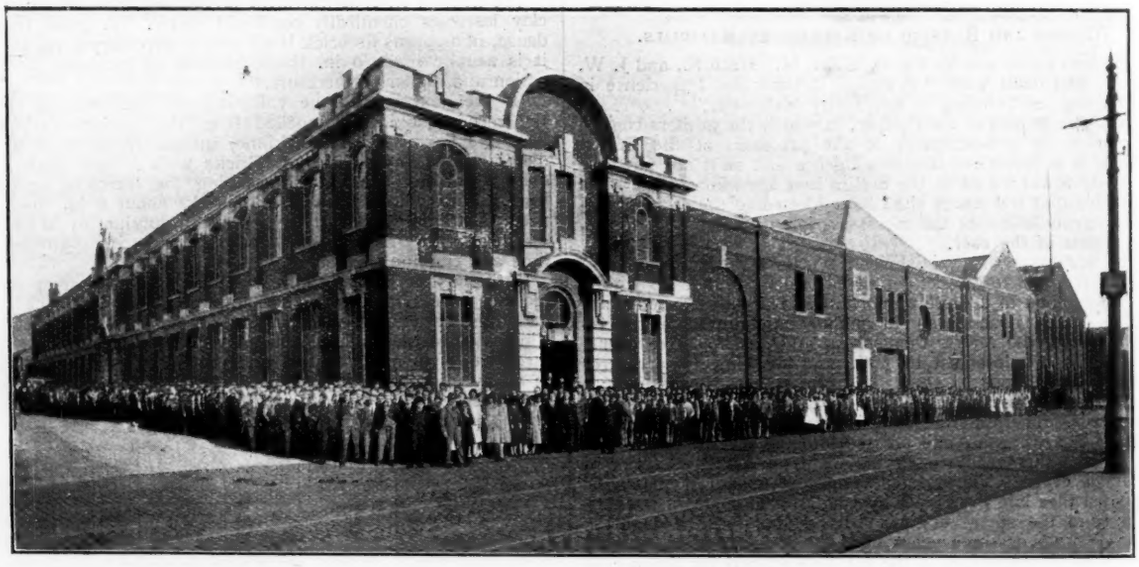
The last paper to be read was by H. M. RIDGE, who considered the use of modern clayworking machinery on the Continent. The paper dealt with various types of clay feeders, kiln coal feeders, and clay excavators, all of which possessed features of practical importance such as made them worthy of serious consideration. Mention was made of an electrically-heated kiln for firing pottery, which the author had seen working very efficiently in Sweden.

The final paper, by C. E. MOORE, related to investigations with Stourbridge clay. It was communicated by title, and will be printed in the Society's Transactions.

ALBION IRON WORKS.

Extensions at Miles Platting, Manchester.

[This article, by Mr. F. J. West, Chairman of Messrs. West's Gas Improvement Company, Ltd., describing the completion of the extensions at their Albion Iron Works in Miles Platting, Manchester, will be published in this month's issue of the Company's House Journal.]



Looking back over the files of "West's Gas," I find that in 1923 there appeared a series of articles entitled "History of West's Gas Improvement Company, Ltd." In the issue for December, 1923, a plan of the extensions of the Albion Iron Works, as then designed, was given, together with an aeroplane view* of the completed work. This has now been realized.

The development of the site at our disposal has actually followed slightly different lines from those originally contemplated. It was natural, of course, that the new offices should be built upon the main road; and the original lay-out was based upon the arrangement of the office building facing Hulme Hall Lane. This proposal was so far proceeded with that the inside wall was actually built when the new machine and fitting shops were erected just prior to the war. But experience during the war years showed that it was desirable to make drastic alterations in the scheme.

In the first place, the growing volume of material to be transported into and out of the works demanded additional access to the main road, which would have been impeded by building the office across the new shops. This means of access could only be satisfactorily obtained by extending the new bays through to the road.

In the second place, the immense demand for our Glover-West vertical retorts which arose immediately after the war, and which shows no indication of abating, has called for far more drawing-office accommodation than could have been provided on the site originally intended. This aspect of the problem required particularly careful handling. Foreign contracts especially involve a large amount of drawing-office work; and the number and variety of foreign contracts with which we have been called upon to deal has been very great, and again shows no sign of decreasing.

The site in Grant Street, upon which the offices were built in 1921, has many advantages. For the drawing office it provides a large area of convenient shape with north light. For the main entrance it provides a quiet street off the main road, in which motor-cars can stand without inconvenience to anyone. For all offices it provides good light and as much quiet as can be obtained in a busy industrial city. And, above all, it leaves the way open for that extension of the machine and fitting shops which became so necessary to cope with increasing business. These bays have now been extended to front the main road, as can be seen in the photograph reproduced at the head of this article.

It is obvious that the main advantages are a considerable extension to the erecting shop, and greatly increased facilities for loading and unloading outgoing and incoming materials. A new weighing machine installed here has reduced the time of weighing; and the arrangements are such that the overhead cranes are able to transport materials in, and finished products out, direct from and to the motor vehicles.

The opportunity has been taken to move and remodel the

* This was published in the "JOURNAL," Vol. 164, p. 38.

INTERIOR OF FITTING SHOP.

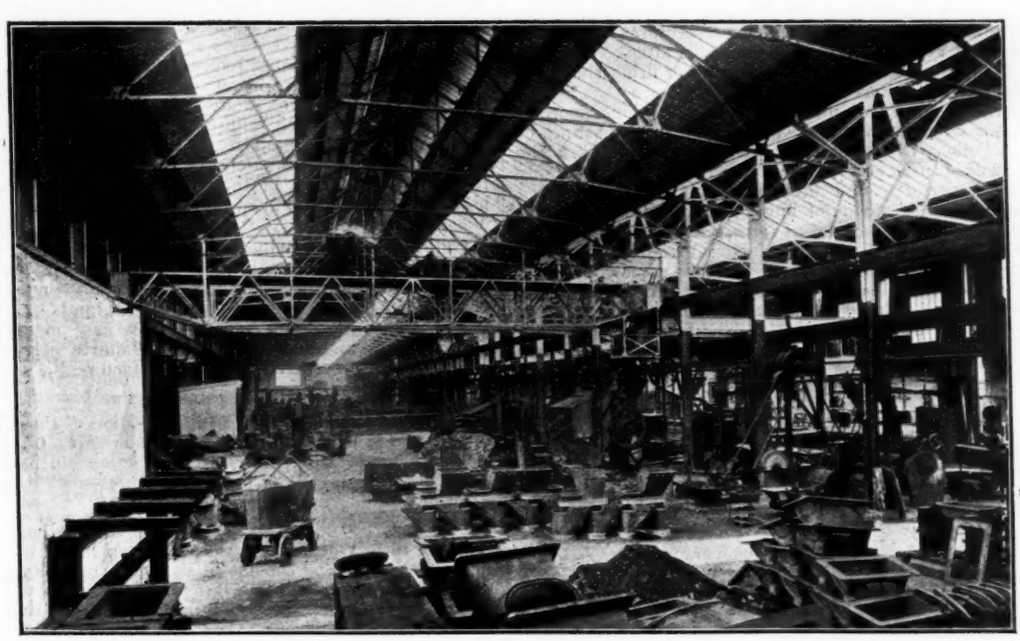
progress stores, and to increase the erecting shop area by 100 p.ct. Here again the change in the character of work done is reflected in internal arrangements, which are different from those originally contemplated. These alterations have now been fully effected. A new and larger tool room is provided in the smaller of the extended bays, and has been equipped with several new machines.

Packing of finished material has hitherto been carried out in a corner of the shop totally inadequate for present-day requirements. The new packing department in close proximity to the new main entrance meets a long-felt want. A small area left vacant between the extended bays and the office buildings has been utilized for the provision of a cycle shed and better arrangements for the workpeople to enter and leave the works.

These extensions, apart from their necessity to cope with a steadily increasing output, will undoubtedly lead to increased efficiency in several departments.

Space will only permit of a short reference to an extension and reconstruction just completed at the other end of the works. Old pupils of West's will remember the "Old Mouthpiece Shop" with its wooden roof and rail beams and massive brick walls. These have now been entirely replaced by a modern steel roofing with steel crane-way and stanchions. The whole has been re-designed and built in line with "B" bay of the steel structural shop, and a new 10-ton overhead electric crane installed which is thus able to operate in duplicate with the crane of "B" bay. So disappears the last of the relics of the old original workshops, and in its place is a greatly increased area which will serve a variety of useful purposes.

F. J. W.



INTERIOR OF NEW MOUTHPIECE SHOP.

British Standard Specifications for Barytes and Boiled Linseed Oil.—The British Engineering Standards Association have issued specifications for barytes and boiled linseed oil. They contain clauses regulating the composition, together with standard reception tests, for the purchase of barytes and boiled linseed oil; and there are appendixes giving methods of carrying out the tests. These specifications have been prepared at the request of the paint manufacturers by a Committee representative of both the buying and the manufacturing interests; and as in the case of all British standard specifications, they will be reviewed as is necessary. Copies of these specifications (Nos. 259 and 260-1926) can be obtained from the B.E.S.A. Publications Department, 28, Victoria Street, S.W. 1; price 1s. 2d. each, post free.

REFRACTORIES IN THE GAS INDUSTRY.

By W. T. GARDNER.

[A Paper before the Refractory Materials Section of the Ceramic Society on Sept. 10.]

Of the gas industry, it is frequently said that profits are made in the retort house. This is to a great extent undoubtedly true; but I would go further, and say that profits are made by the use of retort settings, constructed of suitable refractory material, which are properly designed and operated. I propose in the brief notes which follow to confine my remarks chiefly to refractories employed in the construction of settings for the production of coal gas.

In view of the increased cost of coal during recent years, it is essential, in order to keep manufacturing costs as low as possible, that the speed of carbonization should be increased and the highest possible yield of therms in the form of gas obtained per ton of coal. Increased speed of carbonization means higher working temperatures; and the refractories used in the construction of the settings must therefore be capable of withstanding these severe conditions continuously.

When coal is carbonized, the therms liberated are recovered in the form of gas, tar, and coke; and as a therm in the form of gas has a value many times greater than a therm in the form of either tar or coke, the importance of a high yield of gaseous therms to a gas undertaking will be readily appreciated.

The three chief classes of refractory materials used in this country for the construction of retort settings are known as fireclay, siliceous, and silica. Each of these materials may be employed, and will give good service in retort settings, if properly manufactured and used in suitable positions.

RAW MATERIALS AND MANUFACTURE.

Fireclay Bricks.—In the manufacture of fireclay bricks, the clay usually contains, after calcination, from 55 to 70 p.ct. of silica, 25 to 40 p.ct. of alumina, also small amounts of impurities, such as iron oxide, lime, magnesia, and alkalis. The raw clay as received from the mine is "weathered" by exposure to the atmosphere for some time, which process reduces very considerably the amount of subsequent grinding necessary. The disintegration of the clay brought about by weathering also facilitates the removal of impurities by hand picking.

Fireclay bricks are usually made from a mixture of ground fireclay and "grog" to which a suitable quantity of water has been added. When firebricks made from the same clay are required for different purposes, the proportions, sizes, and nature of the grog are sometimes varied within wide limits. The grog may consist of broken firebrick, calcined fireclay, silica rock, or other refractory materials ground to a suitable size. Grog facilitates the drying of the bricks and reduces the tendency to warp during both the drying and the firing. After drying carefully, the bricks are fired to temperatures of approximately 1200° to 1350° C. To avoid excessive after-contraction, however, it is essential that the temperature of firing should be as near the latter figure as possible.

Siliceous.—This class of material usually contains approximately 80 to 90 p.ct. of silica; the remainder consisting of alumina, together with small quantities of impurities. The raw materials consist either of natural deposits of highly siliceous fireclay or of ground silica rock, such as ganister mixed with ordinary fireclay. Similar burning temperatures are employed for this class of material as for fireclay bricks.

It is well known that bricks manufactured from a mixture of ground silica and fireclay have a refractoriness somewhat lower than that of either the clay or the silica. The character of the finished product, particularly with regard to friability, shrinkage, and refractoriness, depends to a great extent upon the fineness of grinding of the raw materials. During some experimental work carried out a few years ago to solve a problem connected with the excessive contraction of some siliceous bricks, I obtained results varying from 7 p.ct. linear contraction to 5 p.ct. expansion on experimental bricks from dry to fired at 1410° C. depending upon the fineness of grinding of the silica; the finer the grinding, the greater the contraction and the lower the refractoriness. The raw materials were similar in each case. The brick showing 7 p.ct. contraction had a vitreous appearance similar to stoneware and was very dense, and the 5 p.ct. expansion brick had a high porosity and was very friable.

Silica.—Silica bricks usually contain from 93 to 96 p.ct. of silica. The raw material consists of ganister or other rock containing 96 to 99 p.ct. of silica. The rock is crushed to a suitable size, and approximately 2 p.ct. of lime is added to act as a binder in the dry and fired state.

The bricks are usually fired at temperatures of 1350° to 1450° C.; the higher the temperature, the more suitable will be the product for use subsequently at high temperatures over long periods. During the firing process the lime reacts chemically with the fine-grained particles of silica, and assisted by the various impurities present produces a silicate which is sufficiently mobile to permeate the whole mass of the brick. Re-crystallization of the silica takes place, and the quartz originally present is converted into other forms—viz., cristobalite and tridymite—having lower specific gravities, with consequent permanent increase in volume. During the re-crystallization process the mechanical strength of the brick is increased considerably.

From the point of view of the purchaser of silica bricks for use in retort settings, it is desirable that the quartz should, if possible, be entirely eliminated during burning. Since quartz has a specific gravity of 2·65, cristobalite 2·33, and tridymite 2·27, it is evident that complete expansion will be reached only when the whole of the quartz has been converted to tridymite.

In the manufacture of all classes of refractories, the grading of the materials used is an important factor in determining the character of the product and its suitability for the purpose for which it is required.

GENERAL REQUIREMENTS OF REFRACTORIES FOR RETORT SETTINGS.

We may summarize the essential requirements under the following headings:

(1) Good heat resisting capacity.
(2) Good heat conductivity.
(3) Rigidity at high temperatures.
(4) Resistance to attack of fuel ash.
(5) Resistance to attack of salty coals.
(6) Resistance to rapid fluctuations of temperature.
(7) Resistance to abrasion.

We now come to consider the three classes of refractory material in the light of these requirements:

HEAT RESISTIVITY.

Fireclay material of good quality has proved itself to be capable of giving satisfactory service when worked at moderate temperatures. A life of upwards of 2000 working days has been obtained on many installations before renewals have been found necessary. In one installation with which I am well acquainted, the average amount of coal carbonized before the retorts were shut down for repairs was, after 2000 days' working, approximately 11,000 tons per retort. A working life of this duration is, however, considerably above the average. The combustion chamber temperature in such installations would seldom exceed 1300° C.

As the result of tests carried out on various types of carbonizing plant, it has been proved fairly conclusively that an increase of 10 p.ct. in the combustion chamber temperature will increase the speed of carbonization, and consequently the output of gas, by 40 to 50 p.ct. If any such increase is attempted with fireclay retorts, failure of the refractory material, due to softening and deformation, is the usual result. The margin of safety at the temperature mentioned is with the majority of fireclay materials only about 50° C., which is much too small for year in and year out working.

Siliceous material possesses some advantages over fireclay in that combustion chamber temperatures up to 1350° C. may be worked continuously, and an improved throughput of coal obtained. The margin of safety, however, between this temperature and that at which failure will take place is comparatively small, and with the majority of the materials of this class the margin is only approximately 50° C. When the danger point is reached, the collapse of this type of refractory usually takes place fairly suddenly.

SILICA.

Unlike fireclay and siliceous materials, silica may be worked continuously and with safety at 1450° C., or possibly at higher temperatures than this. At this temperature the speed of carbonization is very rapid, and high throughputs of coal are obtained. The margin of safety in this case is approximately 150° C. and, to my knowledge, no failures of silica, due to softening, have occurred in gas manufacture.

HEAT CONDUCTIVITY.

Opinions appear to differ on the question of the relative heat conductivities of fireclay, siliceous, and silica materials. At moderate temperatures there is little or no difference between them, but at high carbonizing temperatures silica is undoubtedly superior to either fireclay or siliceous.

RIGIDITY AT HIGH TEMPERATURES.

Of the three types of material under consideration, well-burnt silica is the only one capable of withstanding a temperature of 1450° C. under a load of 50 lbs. per sq. in. without permanent expansion or contraction. The majority of the best makes of silica bricks will, however, show no signs of collapse under this load at temperatures up to approximately 1600° C.

With few exceptions, siliceous bricks will show signs of squatting under the above-mentioned load at 1400° C., and firebricks at 1325° C. The load, however, on the refractory material in the high temperature zone of retort settings seldom exceeds 20 lbs. per sq. in. In this connection I think I am safe in saying, without risk of contradiction, that it would be difficult to obtain supplies of firebricks in this country capable of supporting their own weight without deformation when maintained continuously at a temperature of 1350° C.

Fig. 1 is intended to illustrate this point. This is a photograph of a portion of a rectangular tube constructed of high-

grade fireclay material, the horizontal limb of which has squatted and distorted as the result of being subjected to a temperature of 1350° C. continuously for a period of several weeks without any load except its own weight.

Fig. 1.

In horizontal retort practice, particularly where stoking machinery is used, it is of the utmost importance that the vertical expansion of the retort supporting walls should be small and even, otherwise deformation of the retorts will take place with possible loss of gas, and difficulties will be experienced in charging and discharging. During recent years it has become a general practice to construct the supporting walls of horizontal retorts of silica, though the retorts may be fireclay, siliceous, or silica; and many disastrous failures have occurred due to excessive and uneven expansion of the supporting walls.

Attack of Fuel Ash.

The fine ash carried forward into the combustion chambers by the producer gas is very variable in composition, but generally has a great affinity at high temperatures for refractories containing more than a small percentage of alumina. Rapid slagging away of exposed surfaces frequently takes place unless some form of protection is provided. The more porous the material, the greater the danger of slagging by molten ash.

With silica the attack of ash is less severe, due, apparently, to the presence of a smaller percentage of alumina, iron, and alkalis, &c., which in other types of refractories react with the ash to form slag. The comparatively large size of the particles of silica in a silica brick also tends to minimize the solvent action of the ash. Silica possesses the peculiar property of absorbing considerable quantities of fuel ash without affecting its load-carrying capacity at high working temperatures.

In vertical retort practice where steaming of the coke charge is carried out for the production of water gas, ash which is liberated from the coke finds its way to the retort wall and causes slagging of the surface to a greater or less degree depending on the type of refractory used. The temperature conditions inside the retort are naturally considerably lower than on the combustion chamber side, and the action takes place much more slowly; the retort wall, nevertheless, may be gradually reduced in thickness, due to slagging, in the case of fireclay and siliceous materials, while silica remains practically immune from attack.

Attack of Salty Coals.

Coals used for gas manufacture contain salt (sodium chloride) in varying amounts from a mere trace to approximately 0·5 p.ct. Towards the end of the carbonizing period, when the coke has reached a temperature of 800° to 900° C., the salt is volatilized, and, mixing with the gas in the retort, is decomposed, with the formation of soda and hydrochloric acid. The soda fumes penetrate the brickwork and combine with alumina and silica to form sodium aluminium silicate, which has a low melting-point. The depth beneath the surface at which the reaction takes place depends upon the temperature.

The hydrochloric acid reacts with iron in the ash of the coke, with the formation of iron chloride, which, in turn, also penetrates the brickwork in company with the soda fumes, and is decomposed, with the formation of iron oxide. This iron oxide combining with the sodium aluminium silicate tends to increase the fluxing action.

Each of the three classes of refractory materials under consideration behaves in a different manner when subjected to the attack of alkali fumes. Silica bricks are capable of absorbing alkali fumes over considerable periods of time without disintegration or loss of mechanical strength. Under similar temperature conditions, the action of alkali fumes is usually much more severe in the case of siliceous bricks than with silica. When one considers that the silica content of siliceous may be only about 5 p.ct. lower than that of silica material, the difference in behaviour may, at first sight, appear to be somewhat extraordinary; but the higher alumina content (approximately 7 p.ct.) of the former probably has an important bearing on the matter.

Temperature appears to play an important part in the attack of alkali fumes on siliceous material. At high working temperatures an intermittent erosion may take place due to the detachment of a thin "shaving" of the face of the retort with the carbon at each scurfing period. It is probable that this thin glassy surface layer detaches itself from the brick, owing to fluctuations in the temperature of the retort face during scurfing. Under moderate temperature conditions the alkali fumes appear to penetrate to a greater depth beneath the surface before reaching a temperature sufficiently high to form a vitreous layer of silicate. Consequently, disintegration may take the form of the flaking-off of an irregular layer of ½ in. to ¾ in. in thickness at intervals of 12 to 18 months.

Several years ago an investigation was carried out to ascertain the cause of the failure of some siliceous retorts which had become unworkable due to roughness as the result of irregular erosion brought about by the use of salty coals. Analysis of the glassy surface layer revealed the fact that the alkali content had increased from 0·54 p.ct. in the original brick to 3·8 p.ct., and the iron oxide (Fe_2O_3) from 1·5 to 2·8 p.ct. The salt content of the coal in use was approximately 0·3 p.ct.

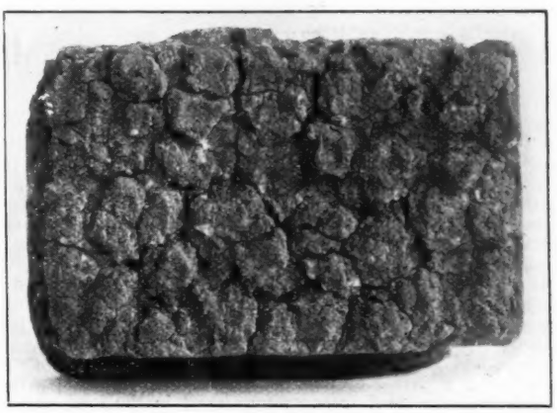


Fig. 2.

In the case of fireclay material worked at low temperatures, alkali fumes cause the surface to become badly crazed after several years' working; but until disintegration takes place, the crazing seldom causes any difficulties with the working of the retorts.

Fig. 2 shows the crazed face of a fireclay retort brick after use with salty coal under moderate temperature conditions. Under higher temperature conditions the crazed layer softens and forms a more or less uniform coating of slag on the surface of the retort, which is continuously removed in small quantities by the abrasive action of the coke. The alkali content of the crazed layer on the brick shown in fig. 2 was found to be 3·24 p.ct. In two other instances the alkali content of the crazed layer on fireclay bricks was found to be 4·34 p.ct. and 5 p.ct. respectively, against 1·3 p.ct. in the original bricks. The iron oxide content of the former was also found to have increased from approximately 3 p.ct. to upwards of 8 p.ct.

Resistance to Rapid Fluctuations of Temperatures.

Fireclay, siliceous, and silica materials are capable of satisfactorily withstanding the rapid fluctuations of temperature occasioned by the charging of wet coal into retorts having high internal temperatures of the order of 1000° to 1100° C.

In the case of silica the material must be well burnt, and the porosity such that the mechanical strength is satisfactory. If, however, the working conditions are such that the face of the retort is brought within that critical range of temperature at which considerable expansion or contraction takes places for a comparatively small increase or decrease of temperature, spalling of the surface may result. When high combustion chamber temperatures are worked, there is usually a sufficient reserve of heat in the brickwork to ensure the retort face being maintained at a temperature well above the critical range, the upper limit of which is probably in the neighbourhood of 600° C.

I have every reason to believe that, as the result of improved methods of manufacture, coupled with improvements in design, it will be possible in the near future to eliminate the spalling of silica.

Resistance to Abrasion.

Given suitably graded and well burnt material with which to construct retorts, there appears to be little to choose between the three classes of refractory under review as regards the pro-

perty of resisting the abrasive action of coke and the wear and tear resulting from the use of stoking tools and machinery.

PROPERTIES OF REFRACTORIES.

In the following table will be found some particulars relating to the more important properties of refractories of good quality.

Approximate Averages.

—	Fireclay.	Siliceous.	Silica.
Ordinary refractoriness without load	Cone 29=1650° C. to Cone 30=1670° C.	Cone 29=1650° C.	Cone 30=1670° C. to Cone 31=1690° C.
Refractoriness under load of 50 lbs. per sq. in.	1325° C.	1400° C.	1600° C.
After contraction or expansion—2 hours at 1410° C.	Contraction.	Expansion.	Expansion.
	0·5 to 1·0 p.ct.	0·2 to 0·5 p.ct.	0 to 0·5 p.ct.
Porosity	18 to 30 p.ct.	34 to 37 p.ct.	25 to 35 p.ct.
Apparent specific gravity	1·9 to 2·1	1·6 to 1·63	1·6 to 1·7
True specific gravity	2·6 to 2·7	2·45 to 2·55	2·33 to 2·40
Linear expansion p.ct. 15° C. to 1000° C.	0·5 to 0·6 p.ct.	0·7 to 0·8 p.ct.	1·0 to 1·25 p.ct.

REFRACTORINESS.

From the table it will be observed that the difference in refractoriness without load between silica and fireclay is small, but under load conditions the difference approaches 300° C. The result of the ordinary refractory test by itself is therefore of little value in deciding whether a refractory material other than silica is likely to prove satisfactory for any particular purpose. In view of the large margin of safety between good carbonizing temperatures and the average squatting point of silica under load, the information obtained from the ordinary refractory test may be used as a reliable guide as to its behaviour in practice.

It is well known that refractories of the fireclay type possess a wide vitrification range, of which the upper and lower limits are indicated by the results of the ordinary and under-load tests respectively. There are many factors, such as porosity, percentage and size of grog, &c., which affect the vitrification range of a material of any particular chemical composition. Consequently, wide differences may exist in the load-carrying capacity of fireclay bricks from different sources, but all having the same refractoriness as indicated by the ordinary refractory test. Therefore, it becomes evident that fireclay materials when subjected to temperatures of 1300° to 1400° C. lose their rigidity and become highly viscous bodies.

The under-load test determines either the temperature at which a refractory body loses its rigidity or its viscosity at a certain temperature, depending upon the method adopted in carrying out the test. It is unfortunate that sufficient progress has not yet been made with the standardization of the under-load test to warrant its inclusion in the Gas Engineers' Refractory Materials Specification, for purchasers are still more or less in the dark as to the value of the various materials on the market, and frequently have to pay a high price for experience gained as the result of failures. A considerable amount of valuable research work, however, has been carried out in this direction, the result of which will tend to throw some light on the mysterious behaviour of refractories of the fireclay and siliceous types under load at comparatively low temperatures. With reference to the Institution of Gas Engineers' test for refractoriness, on the whole little difficulty is experienced in securing supplies of the three types of refractory material conforming to the requirements of the specification.

AFTER CONTRACTION AND EXPANSION.

Difficulties are still sometimes experienced in securing supplies of fireclay and siliceous materials having a satisfactory after-contraction; but in the case of silica considerable progress has been made during the past few years in improving the quality of the material, which now usually conforms to the specified 0·5 p.ct. after-expansion after 2 hours' heating at 1410° C. In view, however, of the fact that silica material is being worked in retort settings at higher temperatures than that specified for testing, it is highly desirable that a further revision of the specification be taken in hand in the near future.

Various workers in the field of refractory research have been attacking the problem of the relationship of the after-expansion of silica to specific gravity.

It is well known that a high after-expansion in the case of silica bricks indicates that conversion of quartz to cristobalite and tridymite has been very incomplete; and when such bricks are used, the further conversion and resulting expansion must take place in the setting. When the degree of conversion in the bricks used in the construction of a setting varies considerably, unequal expansion of adjacent bricks may lead to the development of cracks through which leakage of gas may occur. It is therefore important that the kiln firing should be carried out in such a manner that the whole of the finished product shall have a uniformly low after-expansion. From the data in the table given below, it will be apparent that the present after-expansion test does not discriminate sufficiently between well fired and badly fired bricks. The test results were obtained from a large number of bricks made by one firm. After carrying out the usual after-expansion test at 1410° C., the same test pieces were fired for a further two hours at 1500° C. The total expansion figures given in the last column indicate the final expansion which would take place in the retort setting after a prolonged period of heating at ordinary working temperatures.

Specific Gravity Range.	Mean After-Expansion.		
	2 Hours at 1410° C.	2 Hours at 1500° C.	Total.
	P.Ct.	P.Ct.	P.Ct.
2·32 to 2·35 incl.	0·10	0·55	0·65
2·36 to 2·38 ,,	0·13	1·18	1·31
2·39 to 2·41 ,,	0·17	1·46	1·63
2·42 to 2·44 ,,	0·20	1·60	1·80
2·45 to 2·48 ,,	0·37	2·25	2·62

It is of interest to note that the difference in ultimate expansion between the two qualities of material represented in lines 1 and 5 would amount to ¼ in. per ft., this being in addition to the usual reversible expansion of approximately ⅛ in. per ft.

In view of these results and the fact that silica bricks are being used in practice at temperatures in excess of that specified for the test, it would appear that 1500° C. would be a more suitable testing temperature for the after-expansion test. At the same time an upper limit for the true specific gravity would seem to be required, since there is not always a direct relationship between specific gravity and after-expansion. A true specific gravity limit of 2·35 would probably ensure the silica being properly fired.

That it is possible for silica brick manufacturers to produce consistently well burnt material, I might mention that several firms in this country are supplying silica bricks having an average specific gravity of 2·34 and giving an after-contraction test result at 1500° C. not exceeding an average of 0·2 p.ct. Going to the other extreme, the following are the results of tests carried out on a sample of silica brick submitted within the past three months by a manufacturer who has a high opinion of his product and who is anxious to get orders:

After-expansion, 2 hours at 1410° C.	..	Expansion = 1·59 p.ct.
Refractory test	..	Failed below Cone 30.
True specific gravity =	..	2·51.

Further comment is unnecessary.

The following figures relating to three different makes of silica bricks after use at high temperatures in the combustion chambers of retort settings indicate that thorough conversion has taken place:

Maker.	Sp. Gr. True.	Sp. Gr. App.	Porosity.
A	2·31	1·46	36·7
B	2·30	1·64	28·6
C	2·31	1·76	23·6

REVERSIBLE EXPANSION OF SILICA.

One of the most difficult problems connected with the use of silica is its thermal expansion. It is found in practice that the higher the burning temperature of the bricks in the kiln, the greater the expansion at low temperatures. In warming up silica retort settings, it is essential that the utmost care should be taken to raise the temperature very slowly and evenly up to 300° C., during which range of temperature approximately 60 to 65 p.ct. of the full expansion takes place. This high expansion is due to the considerable increase in volume which occurs at approximately 250° C., resulting from the inversion of alpha-cristobalite to beta-cristobalite. A further rapid expansion also takes place at 575° C., at which temperature the alpha variety of quartz is inverted to the beta form. It is therefore necessary to continue to raise the temperature slowly and evenly until after the quartz inversion has been completed—say, 600° C.—by which time upwards of 90 p.ct. of the full thermal expansion will have taken place.

In the case of badly fired bricks containing a large percentage of unconverted quartz, the amount and nature of the expansion taking place below 575° C. will be small and gradual; but when the material reaches this temperature, the expansion will be considerable and will take place suddenly. When proper precautions are observed, the lighting-up of silica settings presents no greater difficulties than the lighting-up of fireclay settings.

LIME CONTENT OF SILICA BRICKS.

If the grading of the raw materials used for the manufacture of silica bricks is carefully watched, there appears to be no difficulty in producing satisfactory bricks having a lime content not exceeding 2 p.ct. There is a tendency, however, on the part of some manufacturers to use an excess of lime—apparently in an endeavour to obtain an improved conversion of the quartz—instead of prolonging the burning period or increasing the tem-

perature. In one instance brought to my notice, where collapse of a combustion chamber wall had taken place due to the disappearance of the jointing cement, the lime content of the silica bricks was found to be 3·7 p.ct. Fortunately, such happenings are rare.

Jointing Cement.

Though the jointing cement used in the construction of a retort setting only occupies a small volume of the whole, it nevertheless plays an important part in determining the useful life of the plant. A chain is no stronger than its weakest link, and a retort setting has no greater stability under high temperature working conditions than the links used for bonding the bricks together—viz., the jointing cement.

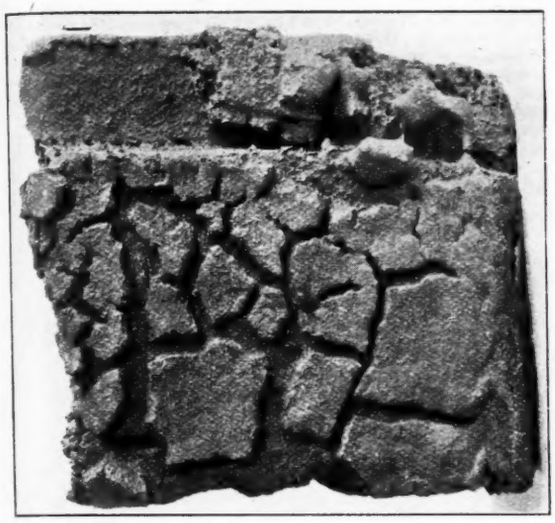


Fig. 3.

The ideal jointing cement will be one having good adhesive and working properties, and will be highly refractory and chemically inert at working temperatures, non-contracting, and capable of maintaining good gas-tight joints.

During construction it is desirable that the brickwork should be built practically brick to brick, and the smallest possible quantity of jointing cement used; the joints being, of course, well filled. Many failures of retort settings have occurred as the result of the too liberal use of unsuitable jointing cement. In the past, ordinary fireclay was used, but this has the disadvantage that shrinkage takes place from the time the joint is made until the brickwork is at full working temperature.

Fig. 3 is intended to illustrate this point. This is a photograph of a fireclay jointing cement on a fireclay tile, which has been in use at a temperature of 1350° C. The shrinkage is of the order of 15 p.ct. It must be admitted that such a joint would prove unsatisfactory, and would easily permit leakage to take place.

To counteract the shrinkage tendency of fireclay, finely-ground firebrick or sand may be added in suitable proportions. For jointing brickwork such as silica, which is subjected to high working temperatures, the chemical composition of the cement should, if possible, be similar to that of the bricks. Where clay is used to give the cement the necessary plasticity, the percentage should be kept as low as possible, otherwise the joint will be absorbed by the bricks (particularly if the lime content of the brick is high), with the result that the structure may collapse.

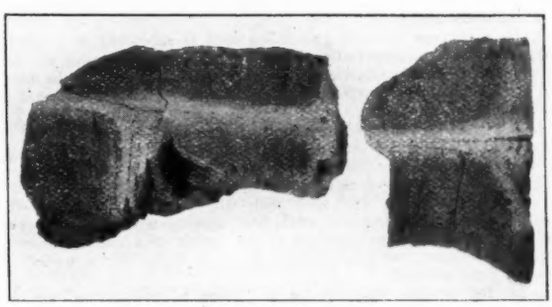


Fig. 4.

Fig. 4 shows a typical example of the absorption of jointing cement containing an excess of clay by silica bricks of normal composition working for a considerable period at high temperature. It will be noticed that the cement has been to a great extent absorbed by the bricks. In this particular instance the brickwork settled down, due to the skeleton of cement, remaining after the absorption of the excess of clay, being unable to withstand the superimposed load of the brickwork above.

In conclusion, I wish to express my thanks to my chief, Sir Arthur Duckham, for permission to compile these notes.

SCOTTISH JUNIOR GAS ASSOCIATION.

(EASTERN DISTRICT.)

Visit to Perth Gas-Works.

The postponed visit to Perth took place on Saturday, Sept. 11, when about fifty members responded to the invitation. They were received at the works at Friarton by Mr. David Vass (Engineer and Manager) and his Assistants, Mr. Alan McG. Clark and Mr. A. R. Wilson. Mr. Polson, of West's Gas Improvement Company, was also in attendance. An excellent opportunity was accorded the visitors of inspecting the works.

The Glover-West Plant.

The installation, arranged in five settings, comprises 40 retorts. Each setting has a steel-lined chimney, and a waste-heat boiler operating under natural draught. The nominal capacity of the plant is 1,500,000 c.ft. per diem. Coal is brought to the installation in wagons running on an elevated railway, and is discharged by hydraulic tippers into a receiving hopper, from which it is fed mechanically to a coal breaker. The broken coal is elevated to, and distributed in, overhead storage bunkers of 48 hours' capacity by means of a West lip-bucket conveyor. By an arrangement of loose plates placed in these bunkers, the capacity may be increased to 60 hours. The conveyor also receives the coke as it is discharged from the retorts. All coal and coke is mechanically handled by electric machinery.

Considerable interest was shown by the members in the Peebles patent automatic self-loading governor, a description of which was given by Mr. A. McG. Clark in his Presidential Address last April (see "JOURNAL" for April 28, p. 223).

Tea.

Following the works inspection the visitors were conveyed to the Windsor Restaurant, where they were entertained at tea by the Perth Town Council.

Subsequently Mr. A. McG. CLARK asked Mr. Vass to convey to the Town Council the thanks of the Association. He trusted that those who had taken advantage of such an excellent opportunity of examining the works, and the extensions recently carried out as described by him in his Presidential Address, had seen something of interest on the practical side. The scheme, which was operating admirably, was the result of a policy initiated by Mr. Vass and carried out by the Town Council.

Mr. VASS, in reply, said that in Perth there were many novelties; the new governor being perhaps the most interesting. It required no attention—the old days of putting on and removing weights had passed. Mr. Vass spoke of the able assistance in carrying out the new scheme he had received from Mr. Clark, whom he congratulated on his appointment to Port Glasgow.

Eastern Counties Gas Managers' Association.—A formal meeting of the Association has been arranged to take place in the Board Room at the offices of the National Gas Council, 28, Grosvenor Gardens, S.W., on Thursday afternoon of this week (Sept. 23), at 2.30. In intimating this to the members, the Hon. Secretary (Mr. W. H. Mainwaring) says that the spring meeting of the Association, which had been fully arranged for, was necessarily abandoned in consequence of the general strike. The coal stoppage has persisted from that time until the present; and in the opinion of the President and Committee, existing conditions would, in such a district as theirs, render the holding of a successful gathering on the usual lines very doubtful. It has been decided, therefore, not to hold the ordinary autumn meeting this year. It is, however, necessary, under the rules, to transact the business of the Association; and it has accordingly been decided to call this meeting of members, in order that the election of officers and other formal matters may be disposed of.

REGISTER OF PATENTS.

Carbonizing Coal.—No. 253,878.

INTERNATIONAL COMBUSTION ENGINEERING CORPORATION, of New York (Assignees of W. RUNGE, of East Orange).

No. 12,816; May 19, 1926. (Convention date, June 17, 1925. Patent of Addition to No. 242,621.)

This invention relates to a modification of that described in specification No. 242,621 (see *ante*, p. 146).

In one form the process of that specification consists in first suspending pulverized coal in an atmosphere of hot gases, which may be oxidizing gases, at a temperature below that at which the coal would substantially be carbonized; and when the particles have lost their power of adhering with one another, separating them from the gases and introducing them into a carbonizing zone. The main purpose is to ensure that the particles of coal shall remain as separate as possible during carbonization, with the object of producing a finely-divided coke or semi-coke.

According to the present invention, in order to attain this object, it is not necessary to subject the whole of the coal carbonized to the pre-treatment. It suffices if a suitable proportion is so treated and this subsequently mixed with the rest of the coal to be carbonized.

The claims are:

1. In a process wherein pulverized coal is subjected to a preliminary treatment substantially as and for the object herein set forth and is subsequently carbonized, improvement which consists in mixing the product of the preliminary treatment with pulverized raw coal and carbonizing the mixture.

2. A process of carbonizing coal which consists in subjecting the pulverized coal to the action of a hot gaseous medium in such a manner as to destroy its agglutinating properties, but under conditions whereby the coal retains practically the same state of division as the original coal, and with only slightly reduced hydrocarbon volatile content, mixing the coal thus treated with raw pulverized coal, and subjecting the mixture to the action of a gaseous medium having a temperature approximating 1000° Fahr. for a period not exceeding 60 seconds.

3. In the process referred to in Claim 2, conducting the first treatment in a gaseous medium at a temperature between 500° and 700° Fahr. for a period not exceeding 60 seconds.

Diagrams accompany the detailed description of the invention.

Gas Meters.—No. 256,436.

HUETTIG, A. R., of Erie, Penn.

No. 26,370; Oct. 21, 1925.

This invention relates to gas meters in which the meter case is divided into two chambers in one or each of which is placed a diaphragm so as to form four compartments in all. The invention is designed to simplify the mechanism of the meter and improve the compactness.

In such meters it is usual to provide means for adjusting the throw of the crank and the angular relation of the crank to the valves; and broadly the invention contemplates the carrying of the movement of a diaphragm in one compartment, by way of a rock shaft mounted in a wall of the compartment, into an adjoining compartment in which is arranged an operating crank. The invention further contemplates an improved and simple adjustment of the throw of the crank, preferably operable through the wall of the case, and also an improved arrangement for varying the angular relation of the crank to the valves, so that the valves may be nicely timed relatively to the diaphragms so as to improve the performance of the meter.

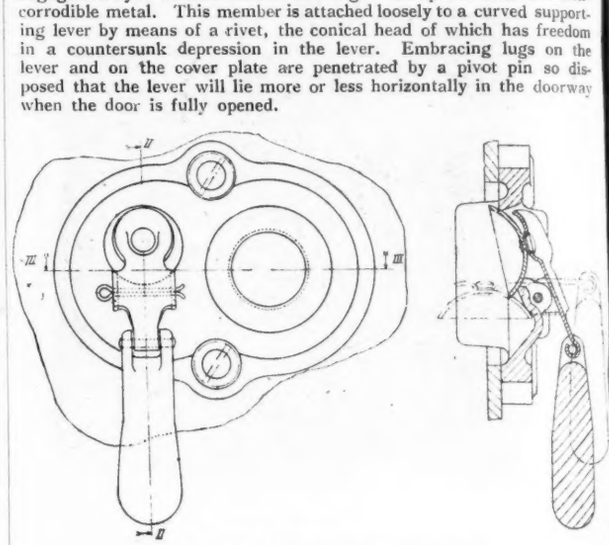
There are other features and details, of course; but the drawings which we reproduce will give a sufficient indication of the design. Fig. 1 is a front view, with parts removed; fig. 2 is a section on the line 2—2 in fig. 3; and fig. 3 is a section on the line 3—3 in fig. 2.

Door-Fitting for Gas-Fired Ovens.—No. 256,779.

KEITH & BLACKMAN CO., LTD., and KEITH, G., both of Farringdon Avenue, E.C.

No. 19,798; Aug. 6, 1925.

The door for a gas baking oven comprises, according to this invention, a cover plate serving to carry the burner and provided with an opening presenting on the interior side of the oven wall a seat engageable by a member formed as a segmental spherical shell of non-corrodible metal. This member is attached loosely to a curved supporting lever by means of a rivet, the conical head of which has freedom in a countersunk depression in the lever. Embracing lugs on the lever and on the cover plate are penetrated by a pivot pin so disposed that the lever will lie more or less horizontally in the doorway when the door is fully opened.



Door for a Baker's Oven.—Keith-Blackman.

On the lower end of the lever is hinged a counterweight which serves as a handle for opening the door member manually for inspection of the flame; the counterweight urging the lever in the direction to close the door. Or a spring may be substituted for the counterweight.

The door seating itself may be formed by machining the boundary of the opening in the cover plate, or a seating of non-corrodible metal may be pressed into the opening.

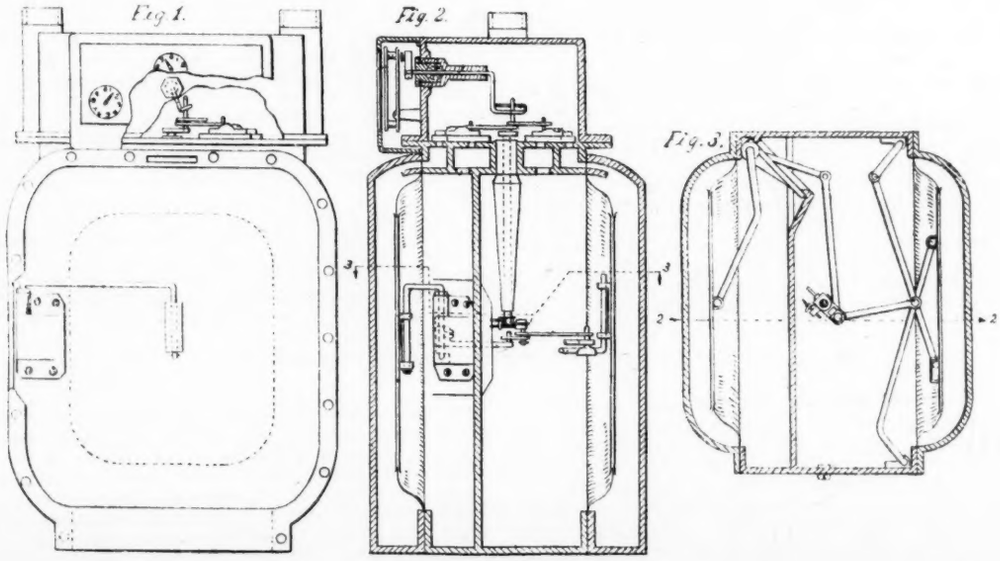
The design is clear from the reproduced drawings, of which fig. 1 is an elevation, and fig. 2 is a section on the line II—II of fig. 1.

Tar for Road-Making.—No. 257,024.

SENSICLE, L. H., of Pelton Fell.

No. 13,263; May 21, 1925.

This invention, broadly speaking, describes certain novel methods of making dehydrated tar without distillation. The tar may be subjected to treatment in a centrifugal separator or separators followed



A Compact American Meter.

by an additional treatment in which air is forced through the tar and in which the temperature is maintained sufficiently high to allow of the desired degree of dehydration, but insufficient for chemical reaction. The invention further comprises the methods of controlling bitumen and carbon content.

In a preferred form of the invention, the tar or mixture of tars is contained in a tank supplied with a heating coil and heated to about 40° C. The tar is blown from this tank by compressed air, or gravitates to the feed of a high-speed centrifugal separator. Using a suitable gravity disc in the separator, it is found necessary carefully to regulate the temperature of the incoming tar within fairly close limits—for instance, by means of a steam core pipe inside the tar feed pipe.

The warm and partially dehydrated tar is allowed to pass from the high-speed centrifugal separator into an agitation tank, where the temperature is maintained at about 60° C. by an enclosed steam coil. Cold compressed air is blown through the warm tar by means of a perforated pipe immersed therein until the moisture content has been reduced to 0·5 p.ct., or as low as required. During agitation bitumen is added when necessary, and the free carbon content is readjusted by adding the material removed from the bowl of the centrifugal separator in the cleaning-out operations.

A subsidiary feature of the invention is the adjustment of viscosity and the reduction of naphthalene and light-oil content by similar treatment at a somewhat higher temperature, and when necessary over a more prolonged period.

The invention does not exclude the possibility of admixing tar distillate fractions—*e.g.*, creosote or anthracene oils and the like or pitch—for the purpose of adjusting the constitution of the mixture before or after dehydration.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Sept. 15.]

Nos. 21,875—22,478.

GORDON, K.—"Production of gaseous fuels." No. 22,415.
HUNTER, C. M.—"Gas burners." No. 22,065.
HUSBANDS, J. A.—"Gas burners." No. 22,439.
I. G. FARBENINDUSTRIE AKT.-GES.—"Manufacture of liquid products from coal-tars, &c." No. 22,244.
I. G. FARBENINDUSTRIE AKT.-GES.—"Purification of crude benzole." No. 22,245.
MAXIM SILENCER COMPANY.—"Silencer for gas engines." No 22,188.
PAYNTER, T.—"Dry gas meter." No. 22,227.
PERRY, H. H.—"Air and gas pre-heaters." No. 21,889.
PHILPOT, H. P.—See Hunter, C. M. No. 22,065.
RADIATION, LTD.—"Gas cookers." No. 22,372.
SYNTHETIC AMMONIA AND NITRATES, LTD.—See Gordon, K. No. 22,415.
YATES, H. J.—See Radiation, Ltd. No. 22,372.

MISCELLANEOUS NEWS.

DISSATISFACTION WITH ELECTRICITY AT ELTHAM.

Noisy Public Meeting.

The dissatisfaction among the 500 housewives who are occupants of houses on the Woolwich Borough Council's Estate on Eltham Hill with the enforced use of electricity for every household purpose, culminated last Wednesday evening, Sept. 15, in a public meeting of "petitioners and those desirous to have the freedom to choose either electricity or gas." The meeting was held in the Parish Hall, but had to be summarily closed, owing to interruptions, without the intended resolution having been put. The leaflet giving notice of the meeting stated: "We are not seeking favours: simply claiming the same freedom accorded to other ratepayers in the borough—the choice of using electricity or gas as individually desired."

The meeting, which was a crowded one—probably 150 people being present—was presided over by Mr. E. R. Gingell, who at the outset explained that it had been called specially for those who had signed the petition to the Borough Council protesting against the refusal to allow gas to be installed on the estate, and also for those who were in favour of gas being installed, but who for some reason or other had not signed the petition. The meeting was in no way antagonistic to the Borough Council, nor was it political in any sense. All that was asked was that the tenants on the estate should be given freedom to use gas if they so wished; and for that reason arrangements should be made for a gas supply to be given.

So far there had been complete orderliness in the meeting; but when the Chairman called upon Mr. B. A. G. Beaten (who has acted as Secretary in the matter) to give a report of the negotiations that had taken place between the petitioners and the Borough Council, and to state the position as it stands at present, interruptions began. The Chairman immediately made it clear that he was not going to allow anybody to speak who had not signed the petition, and bluntly stated that, if there was anyone present who was not in favour of using gas, his place was outside the meeting. This immediately led to a large number of people at the back of the hall claiming that it was a public meeting, and that they had every right to speak. The Chairman again insisted that it was not a public meeting; but it soon became evident that there were a large number of people who had come to the meeting with the object of opposing the proposed resolution to the Borough Council demanding a supply of gas. After this sort of thing had gone on for a while, and the Chairman had retorted that the printed bills which had been distributed to the houses on the estate made it clear that the meeting was for those who had signed the petition and others in sympathy with the movement, he called upon Mr. Beaten to make his report.

Mr. Beaten then outlined all that has taken place with regard to the matter, and pointed out that 313 people had signed the petition to the Woolwich Borough Council claiming the freedom to use gas if they desired. He related the events which have taken place since Feb. 25 last, when this petition was presented to the Council. It was duly acknowledged, but nothing more occurred until March 18, when a letter was received stating that a deputation not exceeding five would be received by the Housing Committee, but that only one member would be allowed to address the Committee. Accordingly, a deputation waited upon the Housing Committee on April 15, when the facts of the position were explained, and some figures given as to the relative cost of cooking by gas and electricity. Mr. Beaten stated that a dinner consisting of 3 lbs. 9 oz. of salt beef, 2 lbs. 10 oz. of potatoes, with other vegetables, had been cooked upon a gas stove as a test by those concerned with this agitation at a cost of exactly 1d.—a statement which was received by cries of "Ridiculous." But Mr. Beaten offered to repeat the test. On the other hand, he stated that it took 3 units of electricity at 2d. a unit to boil an ordinary kettle of water—two speakers later in the evening declared that it took 20 minutes for this kettle to boil—whereas, said Mr. Beaten, by gas the cost was 0·098d., and the time taken six minutes.

Continuing his statement, Mr. Beaten commented upon the fact that, at the conclusion of the interview with the Housing Committee, very few questions were asked, and nothing more was heard until May 21, when a letter was received from the Housing Committee stating that they had been unable to substantiate the statement made by the deputation that 93 houses on the estate out of 105 had resorted to the purchase of oil in order to avoid the use of electricity for cooking. The reply to this on behalf of the deputation was to express surprise, and to inform the Council that it was difficult to find a house on the estate among those who had signed the petition which was not using oil. Nothing further transpired for a short while, when a letter was received from the Town Clerk confirming the Housing Committee's refusal to modify their position and allow gas to be used, and stating again that no confirmation had been obtainable as to the use of oil on the estate. On the contrary, this letter stated that a report had been received from the Borough Electrical Engineer saying that in practically every house electricity was being used for cooking, where electric cookers were installed, adding that a new type of electric cooker would in future be installed having an improved form of hotplate for water boiling. In these circumstances, the Town Clerk continued in his letter that it had been decided that the present regulations not to allow gas on the estate should remain in force. This letter was acknowledged by the petitioners intimating to the Borough Council that the matter would not be allowed to drop, but that action would be taken in another direction.

Mr. Beaten all this time had been allowed to proceed without interruption; but during some references to what he alleged were incorrect statements with regard to the matter in some of the local papers, interruptions began again, and continued throughout to such an extent, as will be seen later, that the meeting had to be closed. Speakers in all parts of the hall rose on points of order or imaginary points of order, and prevented Mr. Beaten continuing his statement for a long while; and considerable ironical laughter greeted the Chairman every time he asked a person wishing to speak whether he had signed the petition. Eventually a noisy crowd of probably fifty or more who were standing at the back of the hall intimated emphatically to the Chairman that they did not propose to allow the meeting to proceed unless they were given the opportunity of speaking. Time and again the Chairman told them that they had no right to be in the hall, as they had not signed the petition, and apparently were not willing to do so. One very excited young man eventually suggested that everybody in the hall—presumably whether in agreement or not—should sign the petition, and evidentally on that basis obtain a right to be heard, and subsequently vote against the resolution. The Chairman, however, easily saw through this manœuvre, and refused to allow the petition to be sent round the hall for further signatures—a decision which called forth further ironical laughter and interruptions. The same noisy section at the back of the hall proposed, and among themselves carried, a resolution that the Chairman should leave the chair; but no notice was taken of this, and a further endeavour was made to carry on the meeting.

Eventually one tenant got the opportunity to complain of the high cost of electricity for cooking and water boiling, and another speaker—it was not made clear whether he was a tenant or not—attempted to repudiate this by claiming that he lived in an all-electric house, and that the cost was not excessive. A few references were interjected to the effect that the Gas Company were at the back of the meeting, while another remark was to the effect that the Gas Company had asked for a subsidy of £30 a house before they would put gas in. Mr. Beaten, too, was on occasions greeted with such remarks as "How much have the Gas Company paid you?" and "Are you a shareholder?" and so things went on for the next half-an-hour or so. Mr. Beaten at one point was able to get in the statement that something like 90 p.ct. of the Housing Committee of the Borough Council were using gas in their own houses in some form or other, to which

the reply was made, "Because the landlords will not allow them to have electricity;" but Mr. Beaten disputed this, and said he was in a position to give the facts.

After this noise and interruption had gone on a little longer, a request came from those at the back of the hall that the resolution should be put. The resolution, as on the agenda, was in the following terms:

> That this meeting of the tenants of the Woolwich Borough Council estate endorses the action taken by the deputation, and pledges itself to support further efforts to secure the choice of electricity or gas, and calls upon the Council to rescind the necessary paragraph of the tenancy agreement.

When the request was made that the resolution should be put, the Chairman, seeing that the attendance consisted of a larger number of those who were prepared to prevent the resolution passing than of those who had signed it, refused to put the resolution, and declared the meeting closed. There was then a general hubbub, and a rather weak attempt was made to appoint a Chairman, from among those who apparently did not desire gas on the estate, to carry on the meeting and pass a resolution in the opposite sense. But the effort failed; most of those present not being inclined to carry the meeting any farther, though a large number stayed behind in the hall, having conversation among themselves.

BITUMINOUS ROADS.

Conclusions at the International Road Congress at Milan.

Regarding concrete roads, one of the conclusions of Section 1 of the Congress (Construction and Maintenance) was that the coating of such roads with hydrocarbons or bituminous mixtures may in many cases be productive of notable advantages, and should be further investigated and carefully examined.

Mr. J. S. Killick, of London, said that a conclusion arrived at by the General Reporter—that the use of bitumen on water-bound macadam was more successful if preceded by an application of tar—was not in keeping with the experience of those in England.

Mr. W. J. Hadfield, of Sheffield, also referred to the General Reporter's conclusion about using tar and bitumen, and pointed out that the effect of mixing bitumen with tar did not represent the experience of road engineers in Great Britain.

The following are some of the conclusions arrived at by the Section.

NATURAL ROCK ASPHALT.

(*a*) The asphaltic rock must be homogeneous and free from any foreign substance, entirely impregnated with bitumen, and must not contain clay in any appreciable quantity. It is recommended that the maximum limit be 2 p.ct. estimated in oxide of alumina.

(*b*) The percentage of bitumen, which may vary between wide limits from 6 p.ct. to 13 p.ct., obtained, if necessary, by blending appropriate proportions of natural asphalt rock or by the additions of hydrocarbons, must be controlled according to the climate and traffic, remaining within the lower limit in very hot climates and with very heavy traffic, and within the higher limit in the reverse case.

BITUMINOUS BINDING MATERIAL.

(*a*) The tests at present in use for bituminous materials are sufficient, on the whole, to ascertain whether a given bitumen is suitable for a given road under given conditions. The Congress, however, expresses the desire that a practical method may also be found of measuring the dimension of a bituminous binding material to an aggregate, and that a complete study should be made of the action of the very fine mineral matter incorporated in bituminous binders, on the so-called asphaltic characteristics of the binding material itself.

(*b*) The penetration figure, usually determined at 77° Fahr. or 25° C., though it may be taken as sufficient to ascertain the constancy to type of a bituminous binding material, provided that the origin and method of preparation are also constant, is not sufficient to give the suitability of such a material to the requirements of a given use. It is recommended to add to specifications for bituminous binding materials the softening or melting point, obtained for preference by the ball-and-ring method.

(*c*) The ductility test, carried out at the one temperature of 25° C., in certain cases is of little significance. It is recommended to add to the specifications a low-temperature test—say, at zero—and also a test at a higher temperature, when dealing with bitumens which, at a temperature of 25° C., give an elongation not exceeding 50 cm.

In several countries good results have been obtained by preceding the surface bitumen treatment by a preliminary surface dressing with tar. This method is specially recommended for macadam surfaces composed of friable and dusty materials. Further, in the experience of several countries, the mixing of bitumen with a percentage of suitably-prepared tar facilitates bituminous coating.

It appears that the addition of tar to an asphaltic binding material, when making asphalt concrete, makes it possible to apply the mixture at a lower temperature. There is therefore good reason for a close study of these mixtures of bituminous binders with tar and its derivatives, either for improving the conditons under which use is made of the materials themselves, or for the sake of economy, wherever the cost of tar and derivatives is considerably lower than that of bitumen.

Reduction in Price at Aberdeen.—The Gas Committee have decided to reduce the price of gas for domestic purposes by 3d. per 1000 c.ft., and to offer a corresponding rebate on gas used for industrial purposes.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following notices regarding applications to the Board of Trade under the Act.

DECLARATIONS OF CALORIFIC POWER.

Brigg Urban District Council.—450 B.Th.U., in place of 500 B.Th.U. (Jan. 1, 1927.)

Clitheroe Corporation.—500 B.Th. U. (Dec. 15.)

Midhurst Gas Company, Ltd.—475 B.Th.U. (Oct. 1.)

AMENDING ORDERS (1926 RULES).

Hampton Court Gas Company.

To substitute for the standard prices of 13·2d. and 12·8d. per therm, standard prices of 15·4d. and 15d. per therm respectively.

Ipswich Gas Light Company.

To substitute a standard price of 15·2d. per therm for the existing authorized standard price of 14·2d. per therm.

Pinner Gas Company, Ltd.

To substitute for the standard price of 16·2d. per therm, a standard price of 17·8d. per therm.

Uxbridge, Maidenhead, Wycombe, and District Gas Company.

To substitute for the standard price of 15·2d. per therm one of 17·2d., and for the standard price of 17d. per therm one of 17·2d. per therm.

INCREASES IN THE PRICE OF GAS.

Further Results of the Coal Stoppage.

The Blairgowrie Gas Light Company have decided to increase the price from 6s. 9d. to 7s. 6d. per 1000 c.ft. after the meter survey at the end of this month.

The Barnard Castle Gas Company have increased the price by 3d. per 1000 c.ft.

The Birkenhead Gas Department have decided to increase the price by 4d. per 1000 c.ft. At present the charge in the borough is 3s., and this will be raised to 3s. 4d. In areas outside the borough the price will be increased from 3s. 6d. to 3s. 10d.

The Buckhaven and Leven Gas Commission have raised the price from 5s. 5d. to 6s. 3d. per 1000 c.ft.

The Calverley and Horsforth Gas Company have increased the price of gas by 1d. per therm, to take effect from the September meter readings.

It was intimated at the annual general meeting of the Dunning Gas Company that it would be necessary during the coming year to raise the price of gas to 10s. 10d. per 1000 c.ft.

Featherstone gas has been advanced in price by 5d. per 1000 c.ft.

The Halifax Gas Committee recommend the Town Council to approve an increase in price equal to 12½ p.ct.

The Holbeach Gas Company have increased the price to 8s. 1½d. per 1000 c.ft.

Leicester gas is to be increased in price 15 p.ct. next month.

After the September quarter meter readings, now about to be commenced, the Liverpool Gas Company will increase their price by 1d. per therm, equal to 4¾d. per 1000 c.ft.

The price at Newburgh has been raised to 7s. 6d. per 1000 c.ft.

The Directors of the Sheffield Gas Company have decided to increase the price to all consumers by 0·4d. per therm, which is equivalent to 2d. per 1000 c.ft., from the September meter readings. The new prices will range from 3s. 1d. to 1s. 10d. per 1000 c.ft., according to the quantity consumed.

An increase is being made by the Windermere District Gas and Water Company, to all consumers, of 10d. per 1000 c.ft., bringing the price to 6s. The new rate will come into force after the September quarter meter readings.

Leatherhead Gas and Lighting Company.—In their report for the year ended June 30, the Directors recommend a further dividend of 4 p.ct., making, with the interim dividend of 2½ p.ct. paid in March last, 6½ p.ct. (less tax) for the year. It is proposed to carry forward to the next account £1003. It is reported that the Company's application for further powers was successful, and that they are authorized to raise £70,000 by the issue of new shares or stock, and are given borrowing powers equal to one-half of the issued capital.

Maryborough (Queensland) Gas and Coke Company, Ltd.—After writing off £450 for depreciation, transferring £206 to the reserve fund (under the provisions of the Gas Act), and making provison for all other charges, the profits of the Company for the six months ended June 30 amounted to £1891. To this has to be added £373 brought forward, making the balance at the credit of profit and loss account £2264. A dividend at the rate of 7 p.ct. per annum was declared, and £500 was placed to reserve for renewals and contingencies, leaving a balance of £321 to provide for taxation.

Chesterfield Gas Department.—In his report on the working of the gas undertaking for the year ended March 31, Mr. H. Davies, the Engineer and Manager, states that the inclined retorts discontinued working on April 22, and that since then the whole of the gas produced has been manufactured in the new horizontal retorts. The results of the carbonization have been good. The gas registered by consumers' meters shows a total increase of 26,674,000 c.ft., or 7·52 p.ct.; ordinary consumers taking 10,319,000 c.ft. more, or an increase of 6·85 p.ct., and prepayment consumers 14,892,000 c.ft. more, or 8·06 p.ct. increase. The year has been exceptionally busy.

CONTINENTAL UNION GAS COMPANY, LTD.

At the meeting of the proprietors next Tuesday (Sept. 28) the Directors will submit the accounts for the financial year ended June 30, and will report as follows:

From a commercial point of view the results have been encouraging. The French undertaking, on which the Company's prosperity depends chiefly, has continued to make excellent progress, in a manner which reflects credit on its management, and has increased its dividend distribution. If French currency had remained stable, the Directors would have been able to report a fair measure of advance on last year's figures. Unfortunately, the improvement in earnings has been more than negatived by the crumbling value of the French franc. During the year under review the franc fell from 108 to 174 to the pound, and has touched 240 at the date of the issue of this report. Until measures, which, to be effective, must involve a choice of sacrifices, are taken to stabilize the franc value, the Company's position must continue to be uncertain. In the meantime, the position is prejudiced by constant fluctuations, of which the general tendency is, unhappily, downwards, and the task of stabilization, with which French statesmanship is faced, grows more difficult. So greatly has the loss on exchange increased during the year, that the balance at the credit of the profit and loss account is considerably less than it was a year ago, when a smaller dividend was paid on the Company's French holdings; and it is a matter of much regret to the Directors that they are unable to maintain even the small dividend of 2 p.ct. on the ordinary stock declared for 1924-25.

After deducting management expenses and pensions charges, and transferring £3000 to exchange reserve account (as against twice that sum last year), the balance at the credit of profit and loss account at the close of the year, including £2306 10s. 2d. brought forward, was £19,691 2s. 4d. Out of this balance there has been paid an interim dividend on the preference stock of 3½ p.ct., less income-tax, for the half-year Dec. 31, 1925, £5600.

The Directors recommend the payment of a final dividend on the same stock at the same rate, less income-tax, for the half-year to June 30, 1926, making 7 p.ct. for the year, £5600. They also recommend a distribution of 1 p.ct., less income-tax, on the ordinary stock for the year to June 30, absorbing £6400. Leaving a balance to be carried forward of £2091 2s. 4d—£19,691 2s. 4d.

AUSTRALIAN GAS LIGHT COMPANY.

Annual Meeting.

The Annual Meeting of the Australian Gas Light Company was held in Sydney on Aug. 12—Mr. GEORGE J. COHEN, Chairman of Directors, presiding.

The CHAIRMAN, in the course of his address, said that during the year 10,786 additional consumers had been supplied with gas; the total number of consumers on the Company's books at the end of the year being 211,843. The quantity of gas sold was 6,387,591,000 c.ft.—an increase of 249,042,000 c.ft., or 4 p.ct., over the preceding year. The business of the Company, he remarked, gave every promise of continuous increase; and as provision for coping with an increase had to be made well in advance, the Directors decided to raise further capital to provide additional plant. On Nov. 23, 1925, 40,000 new "A" shares were sold by auction. The average price realized was £6 13s. 9½d., which price the Directors considered satisfactory, and indicative of the confidence which the investing public reposed in the Company.

PROFIT AND DIVIDEND.

The gross profit made during the year, after providing £130,000 as a contribution to the special purposes fund, was £355,480; and the net profit, after providing for interest on debentures and loans, was £259,169. Dividends for the past year at 8 p.ct. per annum would absorb £261,109, as compared with £237,752 for the previous year. The sum to be carried forward to the next year's accounts was £27,112, compared with £29,053 brought forward.

The Directors had adopted a policy of decentralizing the service; the area supplied by the Company being so great as to prevent efficient service being rendered from only one or two centres. A new branch office, with showroom and service depôt, had been opened at Rose Bay on March 1, and would doubtless be of great benefit to the consumers in that district. Further to increase the efficiency of the Company's service, the Directors had under consideration a scheme for the erection of other district offices in certain of the rapidly-growing suburbs.

Consideration was also being given to extensions to the works; coal handling and storing plant, gas-making plant, and plant for the treatment of bye-products being under review.

Considerable developments had taken place during the past year in the use of gas for industrial purposes in Sydney. At present seventy-six trades were using the Company's gas, the number of consumers being 902. These consumers used 293 million c.ft. during the year—the increase being 29 p.ct.

The report and accounts were adopted unanimously, after the motion had been seconded by the DEPUTY-CHAIRMAN, Mr. S. H. Cary.

Darlington Gas-Works Accounts.—The accounts of the County Borough of Darlington Gas-Works for the year ended March 31 show an income of £108,459, and an expenditure on revenue account of £99,132—leaving a gross profit of £9327. After meeting interest and sinking fund charges, there remained a net profit of £2165, which was transferred to the reserve account, making the amount in this account, at March 31, £15,629. The make of gas was 622,182,000 c.ft., as compared with 604,506,000 c.ft. in the previous year, when the net profit was £70.

HIGH-PRESSURE GAS FOR PUBLIC LIGHTING.

The Burnley Corporation are still extending the use of high-pressure gas for public lighting in some of their principal thoroughfares, and a contract has been placed with Messrs. James Keith & Blackman Company, Ltd., for the supply, in the first instance, of some 31 of their 1000-C.P. high-pressure suspension lamps, together with their raising and lowering gear. A number of these lamps are to be suspended from the tramway trolley brackets, others from span wires, and others from new columns and brackets. The lamps will be fitted with automatic lighters, enabling them to be lighted up, or turned out as a whole from some central point, and at the same time individual control to each lamp can be secured by the control cock on the rising pipe on the tramway or other standards.

High-pressure gas is to be used also for the supply to Keith lamps outside retail premises, on the line of the high-pressure mains; and it is confidently expected that many people will avail themselves of the advantages to be derived from the use of high-pressure gas, which still remains the most efficient and up-to-date method of artificial lighting.

This is an excellent example of the combination of high-pressure street lighting with shop or parade lighting, and is similar to installations in Leeds, Manchester, Newcastle, Middlesbrough, Leamington.

MODERN EQUIPMENT IN GAS OFFICES.

In the mass of information which reaches us regarding increased efficiency and up-to-date methods on the works and district, the possibilities of saving time and money, lightening work, and improving results in the offices of gas undertakings are liable to be overlooked. In this connection, the following report from the Engineer and Manager of the Belfast Undertaking to his Committee, on the subject of reorganization of the Gas Offices, will be of interest.

Mr. Smith said: "I have been giving some attention lately to the reorganization of the work in the Gas Office, City Hall. The total number of consumers supplied through ordinary meters has reached a total of 56,303, being an increase of 4741 since 1920. Under the present system of working it would be necessary to institute a new rental ledger and appoint an additional Collector, Rental Clerk, and Assistant. As our staff is already large, and accommodation is limited, I have been seeking a way to prevent any increase of staff. The present situation can, I think, best be met by the introduction of mechanical aids, and I consider the best mehod would be to purchase an Addressograph machine. At present 24 persons are occupied one month each quarter writing out by hand about 56,000 names and addresses. With the Addressograph machine it would be possible for one operator to do the same work in about ten days. In addition, the clerks would have more time for the making-out of the gas accounts and other general work. I have accordingly obtained a quotation from Addressograph, Ltd., for a suitable machine for printing the accounts, together with a machine for making the address plates and all the accessories; and I recommend you to accept the offer. I also recommend that we ask this firm to supply an expert operator temporarily. I think improvement can also be made in the working of our Auto-Meter Department. We are at present using Burroughs adding and listing machines, and have got very good results. If we can get machines of this type to facilitate the making-out of gas accounts, and the book-keeping connected therewith, I consider it would be a very great improvement. I have therefore to ask your authority to experiment with the Burroughs machines for this purpose; and when I have reached a definite conclusion as to their usefulness or otherwise, I shall report to you again."

The necessary authority for the purchase was given.

TRADE NOTES.

Change of Premises.

We understand that Messrs. Dougall's Gas Meters, Ltd., will shortly move to more commodious premises at Church Wharf, Chiswick, where the firm will be better able to deal with a largely increasing business.

Thames Bank (Blackfriars) Iron Company.

The Thames Bank (Blackfriars) Iron Company, Ltd., intimate that they have removed to larger and more convenient premises. Their new address is: Lodge Road, St. John's Wood, London, N.W. 8. Telephones: Paddington, 7482, 7483, 7484; telegrams: "Hotwater Eusroad, London."

Steam Accumulators.

Messrs. Fairfield-Howden Ruths Steam Accumulators, Ltd., of Westminster, have received an order from the Bradford Dyers Association, Ltd. (Adams Hamilton & Sons, Ltd., Branch, Paisley), for a steam accumulator with a storage capacity of 20,000 lbs. between the pressures of 165 lbs. and 50 lbs. per sq. in., together with the necessary automatic valves. The size of the accumulator is approximately 47 ft. by 13 ft. The principle of steam accumulation, which is being freely adopted on the Continent, is making headway here.

Sands and Clays.

Mr. A. L. Curtis, Westmoor Laboratory, Chatteris, has published a new edition of his booklet on "Sands, Clays, and Economic Minerals for all Industrial Purposes." In their own interests, manufacturers should purchase supplies of raw materials only from those concerns who can be relied upon to keep bulk deliveries up to sample, as far as commercially possible, by constant examination and test. For this purpose Mr. Curtis recently opened a laboratory, equipped with the latest apparatus. A technical department is at the service of all users of the materials Mr. Curtis supplies, which include monazite sands, fireclays, diatomaceous earth, &c. Those interested in the subject would be well advised to read this new booklet.

EXTENSIONS.

Mains and Services.

The Newark Borough Council having recently taken over the Newark Gas Company, and being desirous of extending the gas services of the town, made an application to the Ministry of Health for sanction to borrow £12,000 for the provision of mains and services, and £10,000 for working capital. At the Town Hall last week, Mr. G. H. Thistelton Dyer, M.Inst.C.E., conducted an inquiry into this application on behalf of the Minister of Health.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Sept.* 20.

There is little new to report in the tar products market. Supplies are scarce, and values generally remain firm at the figures last indicated.

Tar Products in the Provinces.

Sept. 20.

The average values of gas-works products during the week were: Gas-works tar, 84s. to 89s. Pitch, East Coast, 117s. 6d. to 120s. f.o.b. West Coast—Manchester, 110s. to 112s. 6d.; Liverpool, 112s. 6d. to 115s.; Clyde, 116s. to 118s. Benzole, 90 p.ct. North, 1s. 11d. to 2s.; crude, 65 p.ct. at 120° C., 1s. 4d. to 1s. 5d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 11d. to 2s. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal-tar crude naphtha, in bulk, 9d. to 9½d. Solvent naphtha, naked, North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 8d. to 8½d.; salty, 7¼d. to 7¾d.; Scotland, 7⅝d. to 7⅞d. Heavy oils, in bulk, North, 7½d. to 7⅝d. Carbolic acid, 1s. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, 90s. to 100s., bags included. Anthracene "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

There are still no signs of a resumption of coal business, and, though there are a certain number of inquiries from abroad for cargoes after the end of the strike, collieries are not willing to commit themselves to any prices which might bring business.

There has again been heavy chartering of boats for import cargoes of coal well into next month. Local opinion still cannot see any prospect of an early settlement, believing that the stoppage will die a natural death by the gradual return to work of the men. At present there is not much evidence of this locally.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

During the past week there has been a shortage of Government gas coal, which may be an indication that the end of the dispute is drawing near. Figures have appreciated for prompt deliveries of available fuel.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

There is a steady improvement in the tonnage raised in Midland coalfields. The cost of working under prevailing conditions is so high that colliery managements say it is no easy matter to make ends meet except in pits which are specially favoured. Prices tend upwards, but not pronouncedly so. Warwickshire and Cannock Chase coals are now going into districts which have hitherto been outside their radius. When the Controller has made his appropriations, there is not much left over for the open market.

At the majority of the pits one screening is as much as the coal gets; hence there is still considerable dislocation in manufacturing branches owing to difficulty in obtaining the grades and sizes requisite for special heat treatments. Nuts and beans are called for to a much larger extent than present exigencies enable to be met.

The anomalies of the control are strongly criticized by dealers who are concerned with the domestic trade. It is apparent that the regulations are more honoured in the breach than the observance. The wisdom of retaining restrictions which cannot be enforced is questioned by those who think the emergency could be more effectually met in other ways. In prosecuting vendors and buyers for breaches of the ordinance, the Birmingham Controller said the position was not so favourable as it was a few weeks ago; the expectation of larger supplies from pits at home having arrested importation.

Early Public Lighting in the North of England.—Referring to early public lighting in its district, the "Newcastle Chronicle" says: While the Institution of Public Lighting Engineers is in our city, it is worth culling from local history the fact that gas lighting was first introduced into Newcastle in January, 1818—108 years ago. Gateshead followed suit a year later; but North Shields was not enamoured of the new illuminant, for an elegant snuff-box was presented to a Mr. John Motley for his excellent services in opposing the "innovation of lighting the town." Notwithstanding that the Shields folk preferred darkness to light, the presentation night "was spent with the greatest harmony." By the year 1820, however, there was repentance of the resistance to gas light, and the town discarded its oil lamps. South Shields was more conservative than its neighbour, for its streets were not lit by gas until 1829.

Blantyre's New Gas Supply.—Negotiations between the Middle Ward of the Lanarkshire County Council for the purchase of the Blantyre Gas-Works have been concluded, and in a short time Blantyre consumers will be supplied from the Cambuslang Works. The Blantyre Works are to be retained for another year as a stand-by in case of emergency.

Rotherham Council Refuse Request for Gas.—At the last monthly meeting of the Rotherham Rural District Council, it was mentioned that practically the whole of the tenants of the Dalton Estate desired the Council to make supplies of gas available in the houses. It was pointed out, however, that the Council would not be justified in incurring the additional expenditure in view of the fact that arrangements had been made for supplies of electricity.

Gas-Works Queues for Coke.—During the last few weeks it has been the custom of the Manchester Gas-Works at Gaythorn to issue every day a thousand vouchers or checks entitling the holders to two shovelfuls of coke, for which 5d. is charged. This custom has brought a queue to the gates of the works every morning. The people begin to gather at about half-past seven; at eight the gates are opened and the applicants file in; and by nine or ten the thousand checks have been distributed.

Theft of Gas at Mitcham.—On Wednesday, Sept. 15, James and Mary Stevens, of Church Street, Mitcham, were fined £3 each for stealing gas from the Wandsworth, Wimbledon, and Epsom District Gas Company. The case was heard at the Croydon County Court. A pipe had been connected from the main to the appliance—a gas cooker—so that the apparatus could be used without the gas being measured. While this method was being practised, a certain amount of gas was allowed to pass through the meter, to lull any suspicion that things were not as they should be. Stevens said he had been employed by the Gas Light and Coke Company for about seven years.

Alliance and Dublin Consumers' Gas Company.—In their report for the half-year ended June 30 last, the Directors say that the accounts show a profit on revenue account amounting to £74,889; and after providing for interest on debenture stock and on temporary loans, there remains the sum of £67,084, to which must be added £15,370 brought from last account, a credit from income-tax amounting to £752, and £53 compensation received for gas lost at the destruction of the shell factory at Parkgate Street, making a total of £83,261. The Directors recommend the declaration of a dividend on the consolidated ordinary stock at the maximum statutory rate of £6 5s. p.ct. per annum, less income-tax, which will leave a balance of £34,765 to be carried to the next account. Encouraged by the enhanced popularity of gas, and the increased sales, the Directors decided to reduce the price as from the reading of the meters for the last June quarter, by 1·2d. per therm, or 5·4d. per 1000 c.ft.

Woking District Gas Company.—An increase of 9½ p.ct. in consumption was reported at the half-yearly meeting of the Company by the Chairman and Managing Director (Mr. Lawrie Trewby). So far, he said, they had not increased the price of gas; and if possible the Directors would avoid doing so, but it depended upon how long the strike lasted. The Company had maintained their supply, and hoped that the consumers who had been using gas so freely during the trouble would, after the strike was over, continue to support the Company—knowing that the Company had supported them. They had again spent very heavily on new mains (£2255). In the last eighteen months they had spent something like £5000 in this direction; and a large proportion of that was due to trunk mains, improving the supply of gas to outlying districts. They were fortunate enough to finish the work before the strike commenced, so they were able to give an adequate supply of gas to every consumer. A dividend was declared at the rate of 6 p.ct., less income-tax, on the "A" and "B" ordinary stocks.

Dunfermline Gas Department.—The annual report of Mr. James Campbell, the Manager, for the year ended May 15 states that the expenditure on revenue account amounted to £51,392, and the income to £73,190, giving a gross profit of £21,798. From this sum is deducted payments for interest and sinking fund, income-tax, expenses of management of consolidated loans fund, and stamp duty on mortgages, amounting to £19,036, and also the debit balance of £2688 from last year, leaving a balance of £72 to be carried forward to the credit of the current year. The quantity of gas made during the year amounted to 370,327,000 c.ft.—an increase of 4·13 p.ct. The average yield of gas per ton of coal was 78·02 therms. The tar plant brought into use last year, states Mr. Campbell, has proved very satisfactory, the net return being nearly double that of the previous year. The contract placed with the Woodall-Duckham Company for the extension of the retort house and erection of additional vertical retorts, together with coke handling plant, is nearing completion, and will be ready for the ensuing winter.

Last Saturday an explosion occurred in York Streeet, Manchester; pieces of paving stone being hurled into the air. It is believed that the explosion was due to the fusing of electric wires.

Owing to the coal dispute, the sale of gas appliances in Bolton is increasing. There are between 600 and 700 more cookers in use in the town than before the dispute. Orders for grillers are also pouring into the gas office at the rate of 100 a week.

On Saturday, Sept. 11, the employees of Lighting Trades, Ltd., gas mantle works at Earlsfield, S.W., journeyed to Worthing for their annual outing. The party, numbering 420, was conveyed by a fleet of fifteen motor-coaches; and the run, which was made in gloriously fine weather, was thoroughly enjoyed. Mr. W. Heap (Works Manager) welcomed the employees at tea, and thanked them for the loyal manner in which they had worked during the past year. That no untoward incident occurred throughout the day with so large a party, reflects great credit on those responsible for the organization of the outing.

STOCK MARKET REPORT.

ALTHOUGH there was no definite move towards a settlement of the coal dispute, conditions last week on the Stock Exchange in the more speculative sections showed signs of improvement. Gilt-edged stocks, however, were somewhat dull. This may be due to the uncertainty with regard to American finance; and fears are expressed that the Federal reserve rate may be raised shortly. Should this happen, with the consequent increase in the Bank of England rate, there must be a decline in high-class securities very damaging to business.

The Industrial and Miscellaneous Markets remained comparatively quiet, with the exception of Tin shares, which were again very active.

The Gas Market showed signs of an upward tendency. Continental Union were quoted 2 points higher, British Ordinary, Imperial Continental, South Suburban 5 p.ct., Tottenham "B" were each marked up one point, and Gas Light gained a half. On the other hand, apart from *ex* div. quotations, Primitiva fell back 3d., and Uxbridge 5 points.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr	Dividends. Last Hf. Yr.	NAME.	Quotations. Sept. 17.	Rise or Fall on week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Aug. 12	5	5	Aldershot 5 p.c. max. C.	72—75	..	
322,992	,,	,,	4	4	Do. 4 p.c. Pref.	65—70	..	..
1,651,868	,,	Apl. 1	6½	6½	Alliance & Dublin Ord.	85—90	..	..
374,000	,,	July 8	4	4	Do. 4 p.c. Deb.	67—70	..	..
300,000	1	May 6	1/7½	1/7½	Bombay, Ltd.	1⅝—1¾	..	68⅜—68⅞
170,000	10	Aug. 26	8½	8½	Bournemouth 5 p.c.	11⅞—12⅛	..	20/—21/-
500,050	10	,,	7	7	Do. B 7 p.c.	11⅞—12⅛	..	..
275,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50,000	Stk.	June 24	3	3	Do. 3 p.c. Deb.	54—57	..	..
163,025	,,	,,	4	4	Do. 4 p.c. Deb.	74—77	..	..
214,740	,,	Aug. 26	12	12	Brighton & Hove Orig.	163—168	..	..
244,200	,,	,,	9	9	Do. A Ord.	125—130	..	..
1,287,500	,,	July 22	5	5	Bristol 5 p.c. max.	85¼—86¼a	..	..
855,000	,,	Mar. 18	8	7	British Ord.	103—108	..	85
100,000	,,	June 24	7	7	Do. 7 p.c. Pref.	114—119	+1	101½—105⅝
120,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	68—73	..	..
100,000	10	June 10	6	8	Cape Town, Ltd.	6½—7½	..	..
100,000	10	Apl. 22	4½	4½	Do. 4½ p.c. Pref.	6—7	..	..
150,000	Stk.	June 24	4½	4½	Do. 4½ p.c. Deb.	68—73	..	..
626,860	,,	July 22	6	6	Cardiff Con. Ord.	94—97	..	..
237,860	,,	June 24	7½	7½	Do. 7½ p.c. Red. Deb.	99—102	..	..
157,150	,,	Aug. 12	6½	5	Chester 5 p.c. Ord.	88—93b	..	..
79,185	1	Apl. 22	†2/-	†2/-	Colombo Ltd. Ord.	28/—30/-	..	..
24,495	1	,,	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	20/—22/-	..	..
1,513,280	Stk.	Aug. 12	5¼	5¼	Commercial 4 p.c. Cap.	77—80	..	..
560,000	,,	,,	5/3/4	5/3/4	Do. 3½ p.c. Cap.	74—77	..	79
475,000	,,	June 24	3	3	Do. 3 p.c. Deb.	55—58	..	..
800,000	,,	Oct. 8	—	4	Continental Union, Ltd.	27—32	+2	55½
300,000	,,	Mar. 4	7	7	Do. 7 p.c. Pref.	85—88	..	28
737,150	,,	Aug. 12	6½	6½	Croydon sliding scale	95—98	..	..
403,100	,,	,,	5	5	Do. max. div.	78—81	..	..
492,270	,,	Aug. 26	9	6	Derby Con.	107—109e*	..	..
55,000	,,	June 24	4	4	Do. Deb.	73—75e	..	..
209,000	,,	Mar. 4	5	5	East Hull Ord. 5 p.c.	84—87*	−2	..
60,000	,,	June 24	5	5	Eastbourne 5 p.c. Deb.	91—96	..	..
1,002,180	10	Apl. 1	†6	†4	European, Ltd.	5—6	..	..
18,788,960	Stk.	Aug. 12	4/17/4	5/1/4	Gas Light & Coke 4 p.c. Ord.	84—86	..	53—53⅛
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	58—61	+½	83¼—85⅛
4,157,020	,,	,,	4	4	Do. 4 p.c. Con. Pref.	74—77	..	59½—61
5,602,630	,,	June 24	3	3	Do. 3 p.c. Con. Deb.	58—61	..	71¼—75½
181,315	,,	,,	—	—	Do. 6 p.c. Br'tf'd Rd. Db.	100—105	..	58¼—58⅝
130,000	,,	—	10	10	Do. 10 p.c. Bonds.	..	..	..
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Aug. 26	6½	6½	Hastings & St L. 5 p.c. Conv	87—92	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	66—71	..	91
70,000	10	June 10	†10	†10	Hongkong & China, Ltd.	19½—20½	..	..
173,200	Stk.	Mar. 4	5	5	Hornsey Con. 3½ p.c.	67—69*	..	..
1,976,000	,,	May 20	10	†10	Imperial Continental Cap.	123—128	−2	..
226,170	,,	Aug. 12	3½	3½	Do. 3½ p.c. Red. Deb.	68—71	+1	124½—126⅜
235,242	,,	Aug. 12	6½	6½	Lea Bridge 5 p.c. Ord.	92—97	..	68—68⅜
2,127,340	,,	Aug. 12	5½	5½	Liverpool 5 p.c. Ord.	79—80b	..	94½—95
600,000	,,	Mar 18	7	7	Do. 7 p.c. Red. Pref.	102½—104½b	..	..
165,736	,,	Aug. 26	9	8	Maidstone 5 p.c. Cap.	112—117	..	..
63,480	,,	June 24	3	3	Do. 3 p.c. Deb.	53—58	..	..
75,000	5	June 24	†6	†7	Malta & Mediterranean	5⅛—5⅜	..	..
541,920	Stk.	May 20	†4	†6	Montevideo, Ltd.	79—82	..	..
2,061,315	,,	Aug. 12	5	5	Newcastle & Gateshead Con.	70⅞—71½d	..	79⅜
360,929	,,	,,	4	4	Do. 4 p.c. Pref.	73—74d	..	..
529,705	,,	June 24	3½	3½	Do. 3½ p.c. Deb.	68½—69d	..	..
15,000	,,	Aug. 26	11½	11½	North Middlesex 10 p.c.	151—156	..	..
91,530	,,	,,	8⅛	8⅛	Do. 7 p.c.	109—114	..	..
300,000	,,	May 6	9	7	Oriental, Ltd.	96—101	..	..
188,120	,,	June 24	7¾	7¾	Plym'th & Ston'house 5 p.c.	108—113	..	100—101
414,500	,,	Aug. 26	—	7/1/0	Portsm'th Con. Stk. 4 p.c. Std.	102—107	..	..
235,792	,,	,,	—	5/0/0	Do. 5 p.c. max.	78—81	..	..
2,283,909	1	—	—	—	Primitiva Ord.	11/6—12/6	−/3	11/9—12/5½
282,200	100	June 1	4	4	Do. 4 p.c. Red. Deb.	83—85	..	..
600,000	Stk.	July 22	4	4	Do. 4 p.c. Red. Deb. 1911	67—69	..	..
180,395	,,	June 24	4	4	Do. B. Aires 4 p.c. Rd. Db.	67—69	..	..
256,847	,,	,,	4	4	Do. R'r P'ts'e 4 p.c. Rd. Db.	67—69	..	..
150,000	10	Mar. 18	6	6	San Paulo 6 p.c. Pref.	7⅞—8⅛	..	67½
125,000	50	July 1	5	5	Do. 5 p.c. Red. Deb.	44—47	..	..
270,000	Stk.	Mar. 18	5½	6	Sheffield A	100—102e	..	..
419,968	,,	,,	5½	6	Do. B	100—102e	..	..
1,047,000	,,	,,	5½	6	Do. C	100—102e	..	..
90,000	10	June 11	4	—	South African	5—7	..	..
6,609,895	Stk.	Aug. 12	7	5	South Met. Ord.	90½—92½	..	..
1,895,445	,,	July 8	3	3	Do. 3 p.c. Deb.	57—60	..	91—92
734,000	,,	Mar. 4	6½	6½	Do. 6½ p.c. Red. Db.	100—102*	..	..
91,500	,,	Aug. 12	8½	8½	South Shields Con.	114—116d	−2	103½
1,187,795	,,	Aug. 12	6½	6½	South Suburban Ord. 5 p.c.	96—99	..	..
368,837	,,	June 24	5	5	Do. 5 p.c. Deb.	92 95	+1	96½—97½
647,740	,,	Mar. 18	5	5	South'mpton Ord. 5 p.c. max	77—80	..	..
121,275	,,	June 24	4	4	Do. 4 p.c. Deb.	68—73	..	..
250,000	,,	Aug. 26	7	7	Swansea 7 p.c. Red. Pref.	100—102	..	..
200,000	,,	June 24	6½	6½	Do. 6½ p.c. Red. Deb.	100—102	..	100½—101
120,000	,,	July 22	7½	7½	Tottenham District A 5 p.c.	105—110	..	..
882,275	,,	,,	5½	6½	Do. B 3½ p.c.	88—91	+1	107½—108½
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	99—101	..	90—91
181,255	,,	June 10	4	4	Do. 4 p.c. Deb.	73—76	..	..
258,251	,,	Aug. 26	5	5	Tynemouth Con. and New	65½—66¼d*	..	..
197,294	,,	Aug. 26	6⅝	6⅝	Uxbridge, Maidenhead, & Wycombe 5 p.c.	80—85	−5	84
88,330	,,	,,	5	5	Do. 5 p.c. pref.	80—85	..	..
91,800	,,	,,	6⅜	6⅜	Do. 5 p.c. Maidenh'd	80—85	−5	..
30,000	,,	July 8	8¼	8¼	Wandsworth, Wimbledon, and Epsom— Wandsworth A 5 p.c.	122—127	..	..
255,636	,,	,,	7	7	Do. B 3½ p.c.	102—107	..	..
412,450	,,	,,	5/19/0	5/19/0	Do. C and New	88—93	..	..
852,000	,,	,,	6⅜	6⅜	Wimbledon 5 p.c.	98—103	..	..
98,000	,,	,,	7½	7½	Epsom 5 p.c.	104—109	..	..
88,416	,,	June 24	3	3	3 p.c. Deb.	54—57	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. *Ex. div.
† Paid free of income-tax. ‡ Plus 8½ p.ct. p.a. special dividend.

The report of the Continental Union Gas Company for the year to June last will be received by the shareholders with mixed feelings. Commercially, the results are satisfactory; but the improvement has been negatived by the fall in the exchange rate, with the result that only 1 p.ct. is recommended as against 2 p.ct. for the previous year. The position of the Company must continue uncertain until measures are taken to stabilize the franc.

On Monday, Bristol 85, British 104⅜, 104½, 105⅜, European 5 7/16, 5⅜, 5⅞, Gas Light and Coke 4 p.ct. ord. 83½, 84, 84½, 84⅜, 84⅝, 84⅞, 3½ p.ct. max. 59½, 60¼, 60⅞, 61, 4 p.ct. preference 75, Imperial Continental 124½, 126, Oriental 100½, 101, Primitiva 12s., 12s. 1½d., 12s. 4½d., 12s. 5¼d., South Metropolitan 91⅛, 91⅜, 92, South Suburban 97, 97½. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99½, Montevideo 6 p.ct. debenture 98½.

On Tuesday, Gas Light and Coke 4 p.ct. 84½, 84⅞, 84⅞. 3 p.ct. cons. debenture 58⅛, 58⅜, Imperial Continental 125, 126½, 3½ p.ct. debenture 68, 68½, Lea Bridge 94½, Primitiva 12s., 12s. 1½d., 12s. 3d., 12s. 4½d., South Metropolitan 91, 91½, 6½ p.ct. debenture 103¾. Supplementary prices, Croydon 7½ p.ct. preference 101½, Gas Light and Coke 5 p.ct. debenture 99¼, 99½, Montevideo 6 p.ct. debenture 98½.

On Wednesday, Alliance and Dublin 4 p.ct. debenture 68⅜, 68⅞, Bombay 20s., 21s., British 101½, European 5⅜, Gas Light and Coke 4 p.ct. 84⅛, 85, 3½ p.ct. max. 59½, 4 p.ct. preference 74⅜, Imperial Continental 125, Lea Bridge 5 p.ct. 95, Montevideo 79¾, Oriental 100, 101, Primitiva 11s. 9d., 11s. 10½d., 11s. 11¾d., 12s., 12s. 1½d., 4 p.ct. debenture (River Plate) 67½, South Metropolitan 91½, Swansea 7 p.ct. preference 100½, 101. Supplementary prices, Barnet 4 p.ct. debenture 74, 75, Brighton and Hove 5 p.ct. debenture 94½, Croydon 7½ p.ct. preference 102½, Gas Light and Coke 5 p.ct. debenture 99¼, Liverpool 5 p.ct. 78½, Tottenham 5 p.ct. preference 85, Wandsworth and Epsom 4 p.ct. debenture 73.

On Thursday, Bristol 85, British 105, Commercial 4 p.ct. 79, 3 p.ct. debenture 55⅛, Gas Light and Coke 84½, 84⅝, 84¾, 85, 85⅛, Imperial Continental 125, Primitiva 11s. 9d., 12s., South Metropolitan 91⅛, 91⅜, South Suburban 96½, Tottenham "A" 107½. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99½, Peterborough 90, 90½, Sunderland 6 p.ct. 98½, Tottenham 5 p.ct. preference 85.

On Friday, Continental Union 2s, Gas Light and Coke 84⅜, 85⅛, 4 p.ct. preference 74½, 74¾, 75⅛, Hastings 5 p.ct. 91, Imperial Continental 125, Primitiva 12s., 12s. 1½d., South Metropolitan 91¼, 91⅜, South Suburban 97, 97½, Tottenham "A" 108¾, "B" 90, 91, Uxbridge 5 p.ct. 84. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99¼, 99½.

Conditions in Lombard Street, while not so easy as is usual on Friday, were nevertheless satisfactory, and new money was available at 3⅜ p.ct. Weekly fixtures were continued at 4 p.ct. Treasury Bills averaged £4 12s. 11·59d. p.ct., being 3·66d. p.ct. less than the previous week.

The Foreign Exchange Market was unexciting. Francs depreciated again, the French rate rising to 173 at one time, finally closing at 172⅛, and the Belgian rate at 178⅜. Italian lire recovered slightly, and closed at 133⅛. Dutch florins were quoted at 12.11¼. Sterling on New York advanced 1/16 to 4.85 15/32.

Silver closed without change at 28⅛d. per oz., and Gold remained at the nominal price of 84s. 11½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3¼ p.ct. at notice.

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UNDISPLAYED ADVERTISEMENTS: Situations Wanted, Six Lines and under (about 36 words), 3s.; each additional Line, 6d. Situations Vacant, Apparatus Wanted and for Sale, Contracts, Public Notices, &c., 9d. per Line—minimum, 4s. 6d.

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